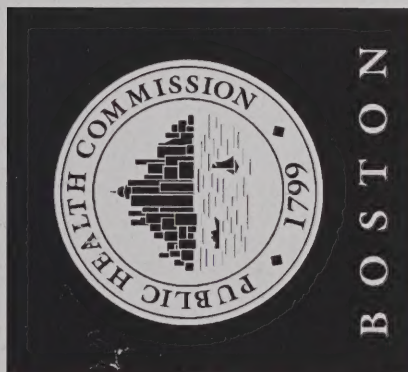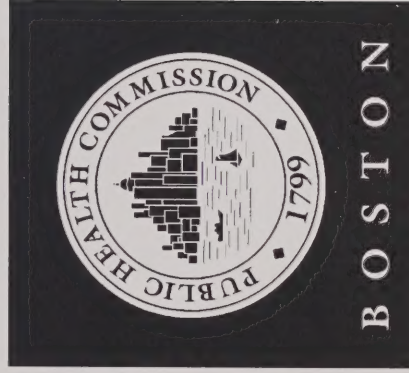BOSTON PUBLIC LIBRARY

BOSTON NATALITY 2001

A REVIEW OF 1999 BIRTH DATA

Prepared by the Boston Public Health Commission
David Mulligan, Chair
John Auerbach, Executive Director

BOSTON NATALITY 2001

BOSTON

PUBLIC HEALTH COMMISSION · 1799 ·

BOSTON

A REVIEW OF 1999 BIRTH DATA

Prepared by the Boston Public Health Commission
David Mulligan, Chair
John Auerbach, Executive Director

Suggested Citation

Boston Natality 2001: A Report on the Health of Mothers and Infants
A Review of 1999 Birth Data
Boston Public Health Commission
Research Office
Boston, Massachusetts
2002

ACKNOWLEDGMENTS

Table of Contents

HOW TO READ AND USE THIS REPORT

What is the purpose of this report?

This report is produced annually to provide the mayor, city administrators, city councilors and the Boston Public Health Commission (BPHC) board, the BPHC executive office, and the public with an overview of issues related to Boston births. It offers a basis for identifying community needs for the purpose of making public policy and is meant to be a resource for discussion at the national, state, and local levels.

How is it organized?

Boston Natality 2001: A Report on the Health of Mothers and Infants includes for the first time several indicators from the linked birth/infant death database. These indicators are helpful in understanding the relationship between risk factors and infant mortality. Information about the linked birth/infant death database can be found in the Technical Notes. Also, for the first time in this report, results of significance testing for selected indicators are included, as well as a special section that discusses major contributors to poor birth outcomes based on logistic regression analysis.

What time period does the report cover?

Generally, the most recent data available for this report is 1999, and the time period presented for trends is 1991 through 1999. See the Technical Notes at the back of the report for details.

What population base does the report use?

All Boston pregnancy-related rates were calculated using the Boston population as listed in the 1990 US census. National or state rates provided by agencies other than the BPHC Research Office may be based on other sources. The Technical Notes provide more explanation of population sources.
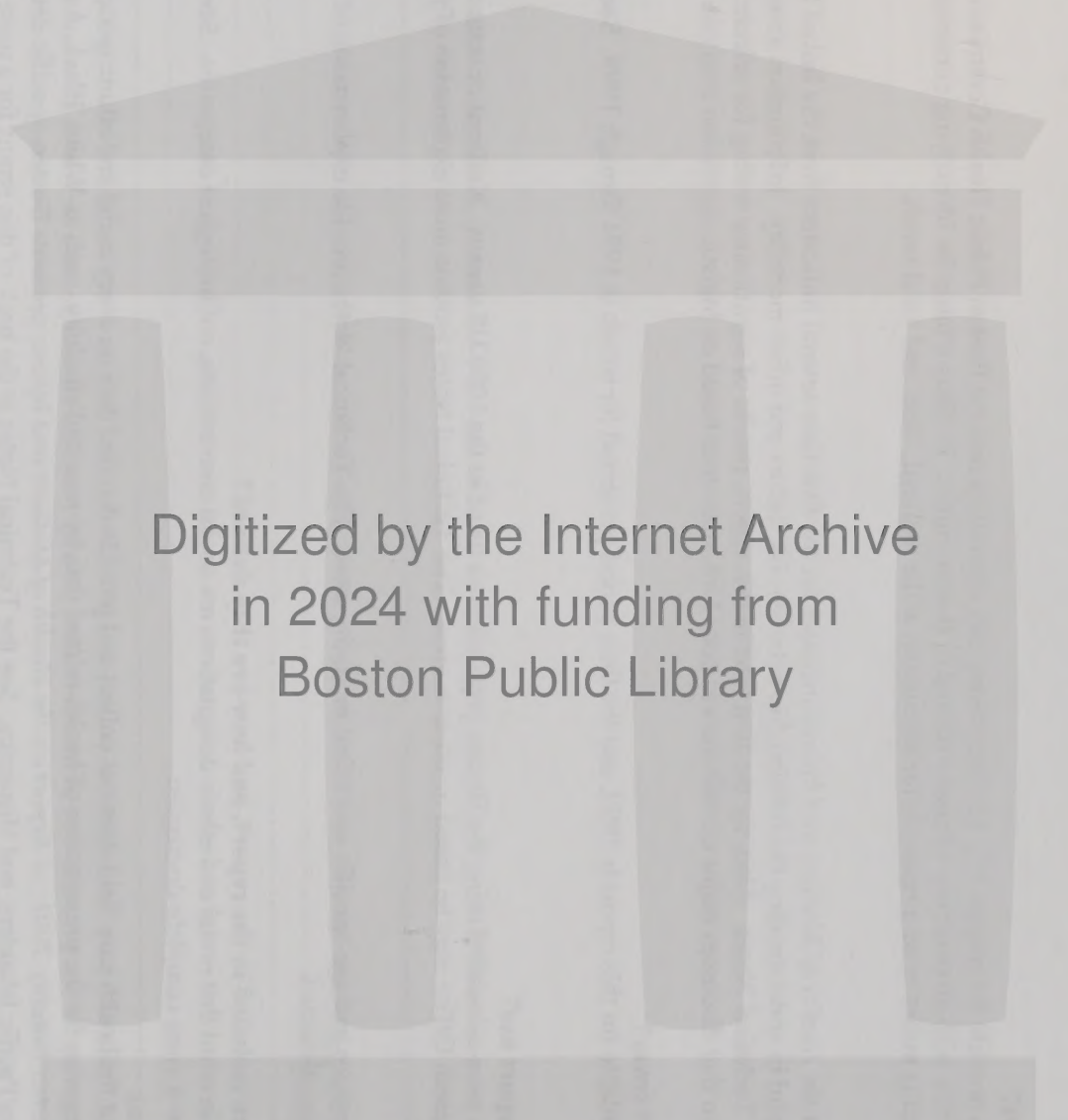
What do the statistics mean?

The data are presented using percentages and age-specific and infant mortality rates. The Technical Notes provide explanations of the rates presented, how they are used, and how they are calculated.

What racial and ethnic groups are included in the report, and how are they defined?

Readers of this report should keep in mind that racial and ethnic designations are social conventions, not biological categories. See Racial and Ethnic Designations in Technical Notes for a more complete discussion.

Boston has a diverse population, but the health care field does not collect and provide detailed data on every racial and ethnic group. Data sources generally use only a few major categories for the presentation of health-related data by race and ethnicity, such as White, Black, Asian/Pacific Islander, Hispanic, and Other/Unknown. *Boston Natality 2001: A Report on the Health of Mothers and Infants* presents Boston-specific data for non-Hispanic Whites, non-Hispanic Blacks, Asian/Pacific Islanders, and Hispanics. See the Technical Notes at the back of this report for a more complete discussion.

viii

Boston Natality 2001:
A Report on the Health
Of Mothers and Infants

Highlights

- The total number of Boston resident live births in 1999 was 8,017, up slightly from 7,883 in 1998.

- One-third (32.5%) of Boston births in 1999 were to Black women; one-third (35.4%) were to White women; 21.4% were to Hispanic women; 7.3% were to Asian women, and 3.4% were to women of another or unknown race/ethnicity.

- About one-quarter of Boston births were to women whose primary language was other than English.

- A substantial proportion (44.7%) of births to Boston residents in 1999 were to women born outside the United States, including the US territories of Puerto Rico and the Virgin Islands.

- Approximately ten percent of births to Boston residents in 1999 were to mothers under age 20; 17.2% were to women over age 35.

- Only 6.7% of Boston women who gave birth in 1999 reported smoking during pregnancy, a lower percentage than in any previous year. The overall decline in smoking during pregnancy by Boston women between 1991 and 1999 totals 60.6%.

- ➢ In 1999, a higher percentage of White women reported smoking during pregnancy (9.4%) than Black women (6.8%). Hispanic women (3.9%), or Asian women (2.1%).

- ➢ A higher percentage of women born in the United States reported smoking during pregnancy (10.5%) than women born elsewhere: 8.4% of women born in Puerto Rico and 9.6% of women born in other countries reported smoking during pregnancy.

- In 1999, more White women (85.3) received adequate prenatal care than Hispanic women (79.8%), Asian women (78.7%), Black women (73.7%), or women of other race/ethnicity groups (63.2%).

- Women born in the Virgin Islands had the highest level of adequate prenatal care (100.0%), followed by women born in the Dominican Republic (90.1%), Puerto Rico (83.1%), and the United States (81.3%). The lowest levels of adequate prenatal care were among women born in El Salvador (57.6%), Vietnam (69.3%), and Haiti (70.9%).

- Boston has not experienced a significant increase in multiple births. Only 3.4% of Boston births in 1999 were multiple births (twins, triplets, and higher-order births). Of the women born in the United States, Black women had the highest rate of LBW in 1999 (13.6%), Hispanic women the second highest (9.2%), and White women the third highest (6.7%). Asian women had too few occurrences to calculate a rate.

- Low birthweight (LBW) declined among Boston births in 1999, falling from 8.8% in 1998 to 8.5% in 1999.

- In 1999, Black Boston women had a significantly higher rate of low birthweight (12.4%) than did White women (6.2%), Hispanic women (7.0%), Asian women (5.5%), or women of other race/ethnicity groups (10.4%).

- Boston women born in Jamaica had the highest rate of LBW in 1999 (12.7%), and Boston women born in China had the lowest rate (3.2%). Women born in the United States had an intermediate rate of 9.4%. Of the women born in the United States, Black women had the highest rate of LBW in 1999 (13.6%), and Hispanic women the second highest (9.2%). White women ranked third (6.7%). Asian women had too few occurrences to calculate a rate.

- LBW was most common in Mattapan (11.1% of Mattapan births), and least common in East Boston (5.3% of East Boston births) and in the North End (5.4% of North End births.

- Fifty-nine Boston infants died in 1999, an infant mortality rate (IMR) of 7.4 deaths per 1,000 live births. The IMR was 17.5% higher than the rate (6.3) in 1998.

- Slightly over four-fifths (86.4%) of Boston infant deaths for which the age at death was known occurred during the first four weeks of life.

- In 1999, Black Boston infants were more than twice as likely to die during the first year of life as White infants, with an IMR of 13.5 per 1,000 live births, compared with an IMR of 5.6 for White infants and 4.1 for Hispanic infants.

- In 1998, the most recent year for which linked birth/infant death data are available, the IMR for low birthweight infants was 29.8 times as high as that of normal birthweight, and the IMR for extremely low birthweight infants, 491.1 times as high as that of normal birthweight infants.

- Among Boston infants during 1998, Black infants accounted for half of the extremely low birthweight births and more than half (54.5%) of the deaths due to extremely low birthweight.

- In 1998, IMRs were lowest for infants of adolescents under the age of 19 and increased with the age of the mother.

- Infant mortality rates were highest for infants born to women who were high school graduates, 12.6 during 1991-1994 and 8.1 during 1995-1998.

- During 1991-1998, for twin births, infant mortality rates were six to eight times greater than the IMRs for singleton births.

- During 1991-1998, IMRs were higher for infants of all races/ethnicities when mothers reported smoking during pregnancy. However, the IMR was higher for Black infants whose mothers smoked than for White or Hispanic infants whose mothers smoked.

3

BIRTHS

Trends

**Births Overall
Boston, 1991-1999**
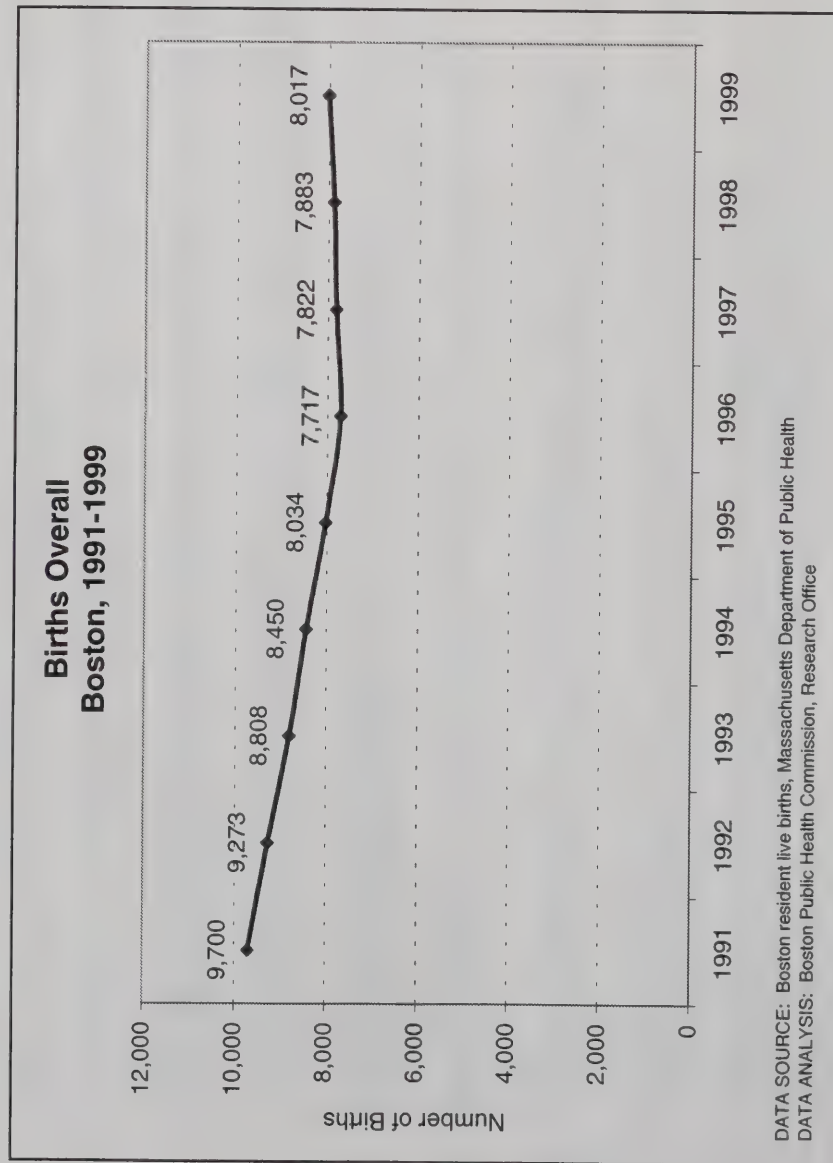
- Boston had a total of 8,017 live births in 1999, an increase of 1.7% over the 1998 total of 7,883 live births.

- This is the third year in a row in which the number of live births to Boston residents has increased.

- However, between 1991 and 1999, births decreased by 17.4%, from 9,700 births in 1991 to 8,017 in 1999.

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

BIRTHS

Birth Rates by Race/Ethnicity

**Birth Rates by Race/Ethnicity and Year
Boston, 1991-1999**

Legend: White · Black · Hispanic · Asian · Boston

Y-axis: Births per 1,000 Women Ages 15-44 (0, 20, 40, 60, 80, 100, 120, 140)

	1991	1992	1993	1994	1995	1996	1997	1998	1999
White	35.3	32.9	31.1	29.6	27.8	27.3	26.6	27.9	28.7
Black	88.3	87.5	85.0	78.8	73.9	68.4	65.2	64.8	67.6
Hispanic	104.5	99.2	95.8	97.8	94.0	88.0	94.8	100.3	97.8
Asian	65.2	70.4	62.5	63.5	65.0	62.0	71.2	57.0	65.5
Boston	58.0	56.1	53.3	51.2	48.0	47.1	45.4	47.8	48.8

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

- Boston's birth rate (the number of births to women ages 15-44 per 1,000 women in that age range) was 48.8 in 1999.

- In each of the years 1991 through 1999, the birth rate for White women ages 15-44 was lower than the rates for women of all other racial and ethnic groups. The rate decreased by 18.7% between 1991 and 1999.

- Between 1991 and 1999, Black women ages 15-44 had the largest decline in birth rates (23.4%) of all racial and ethnic groups.

- From 1991 through 1999, the birth rate for Hispanic women ages 15-44 was the highest of the rates for women of all racial and ethnic groups. The Hispanic birth rate decreased by 6.4% between 1991 and 1999.

- From 1991 through 1999, birth rates among Asian women ages 15-44 fluctuated yearly.

BIRTHS

Age-Specific Birth Rates

- In 1999, the birth rate for adolescents 15-19 years of age was 35.3 per 1,000 females in that age range. Women between the ages of 25 and 34 had the highest birth rate. The birth rate to women ages 20-24 was similar to the birth rate among adolescents. The lowest birth rate was among women ages 35-49.

- Between 1991 and 1999, the rate for adolescents ages 15-17 fell 38.6%. Birth rates for adolescents ages 18-19 declined 21.9% between 1991 and 1999.

- From 1991 to 1999, birth rates for women ages 20-24 declined 28.0%. The rate in 1991 was 54.6 per 1,000 women. Since 1996, this birth rate has fluctuated slightly. Between 1997 and 1999, birth rates for women ages 25-34 rose 4.7%, after a year-by-year decline from 1991 through 1997.

- Between 1991 and 1999, age-specific birth rates continued to increase for women ages 35-49. Between 1991 and 1999, birth rates for women in this age group rose by 25.9%.

Age-Specific Birth Rates by Year
Boston, 1991-1999

	1991	1992	1993	1994	1995	1996	1997	1998	1999
Ages 15-17	52.8	50.7	46.2	46.9	44.9	39.4	40.3	38.5	32.4
Ages 18-19	47.5	47.0	46.4	44.4	38.0	35.2	37.0	38.0	37.1
Ages 20-24	54.6	54.1	50.1	45.7	42.8	39.6	40.8	39.0	39.3
Ages 25-34	80.4	75.1	70.8	68.4	65.1	64.2	63.9	65.0	66.9
Ages 35-49	21.2	22.9	23.5	23.2	23.5	23.6	24.4	25.6	26.7

Births per 1,000 Women in the Specified Age Range

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

MATERNAL CHARACTERISTICS

Race/Ethnicity

**Births by Race/Ethnicity
Boston, 1999**
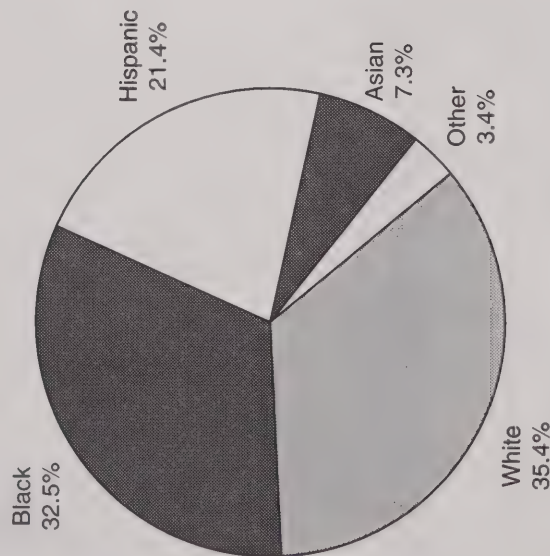
Black
32.5%

Hispanic
21.4%

Asian
7.3%

Other
3.4%

White
35.4%

- In 1999, 2,835 Boston births were to White women, 2,601 were to Black women, 1,716 were to Hispanic women, 584 were to Asian women, 269 were to women of other race/ethnicity, and 12 were to women who did not identify their race/ethnicity.

- The percentage of births that were to White women rose from 35.2% in 1998 to 35.4% in 1999, an increase of less than one percent. The percentage of births that were to Black women increased 2.5% between the two years, from 31.7% to 32.5%. Births to Hispanic women declined 4.4%, from 22.4% of all births in 1998 to 21.4% in 1999. Births to Asian women increased from 6.5% of all births in 1998 to 7.3% in 1999.

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

MATERNAL CHARACTERISTICS

Maternal Ancestry

The major race/ethnicity groupings shown in this and the following three charts are based on women's self-reported race and whether or not they consider themselves to be of Hispanic or Latino origin. Detailed ancestry information is described in this section.
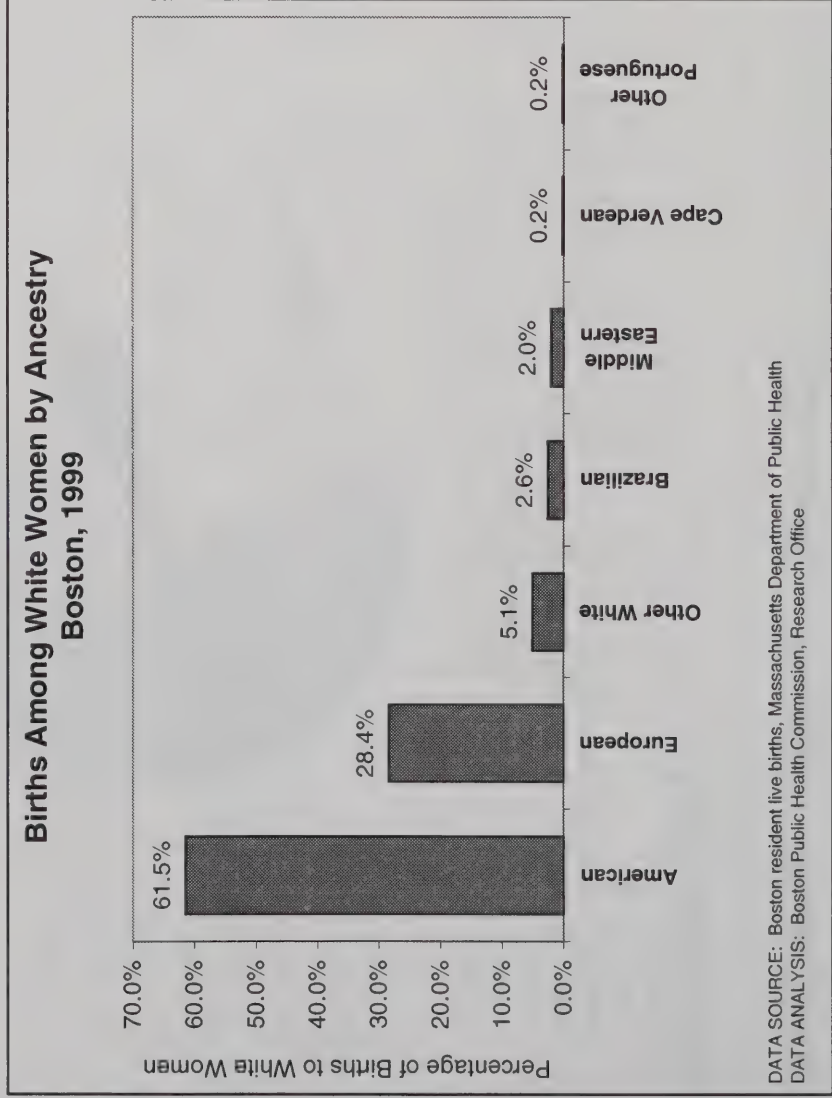
- In 1999, the majority of the 2,825 births to White women for which ancestry information was available were among those who identified their ancestry as "American."

- Other White Boston residents who gave birth in 1999 identified their ancestry as European, Other White, Middle Eastern, or Brazilian.

**Births Among White Women by Ancestry
Boston, 1999**

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

8

MATERNAL CHARACTERISTICS

Maternal Ancestry

**Births Among Black Women by Ancestry
Boston, 1999**
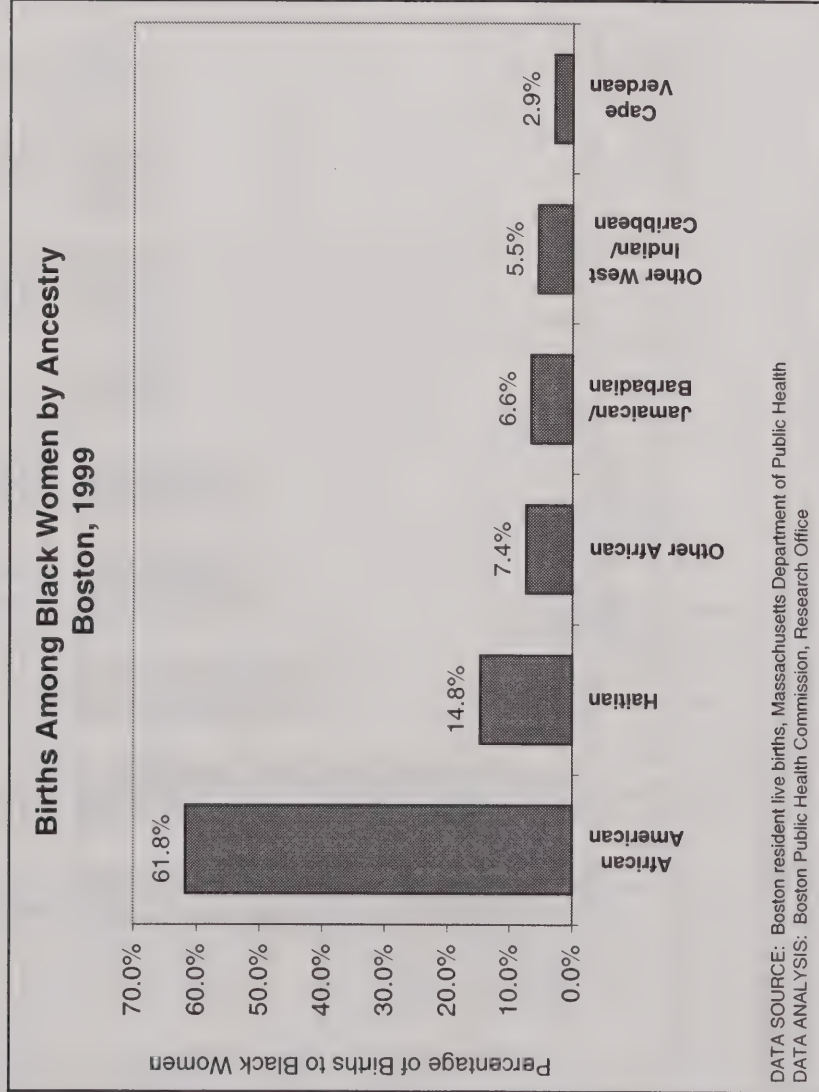
- Among the 2,597 births to Black women for which ancestry information was available, the majority of births were to women who identified themselves as African American, with Haitian and Other African being the next most common ancestries indicated.

- Other ancestries represented smaller proportions of Black births.

MATERNAL CHARACTERISTICS

Maternal Ancestry

Births Among Hispanic Women by Ancestry
Boston, 1999

Percentage of Births to Hispanic Women
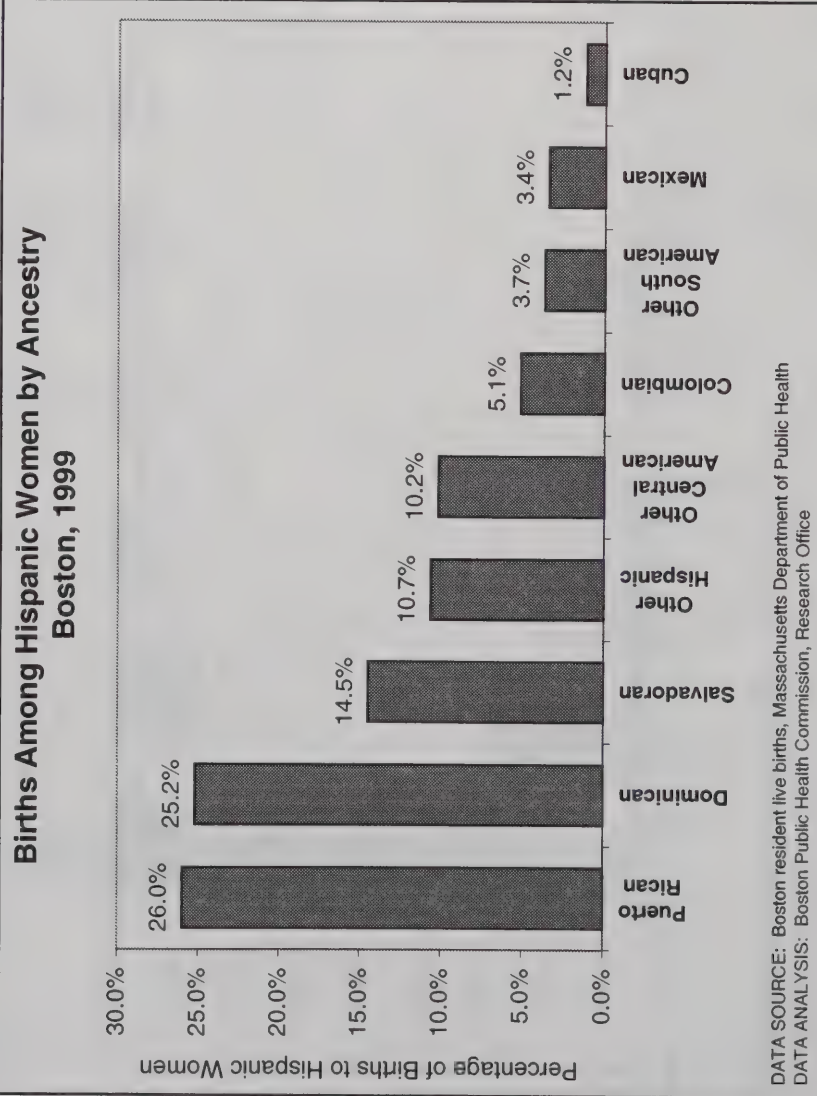
- In 1999, among the 1,716 births to Hispanic women, over a quarter of births were to women of Puerto Rican ancestry, a quarter were to women of Dominican ancestry, approximately one seventh were to women of Salvadoran ancestry, and slightly less were to Other Hispanic women.

- Smaller percentages of births were to Hispanic women of other ancestries: Other Central American, Colombian, Other South American, Mexican, or Cuban.

MATERNAL CHARACTERISTICS

Maternal Ancestry

Births Among Asian Women by Ancestry
Boston, 1999
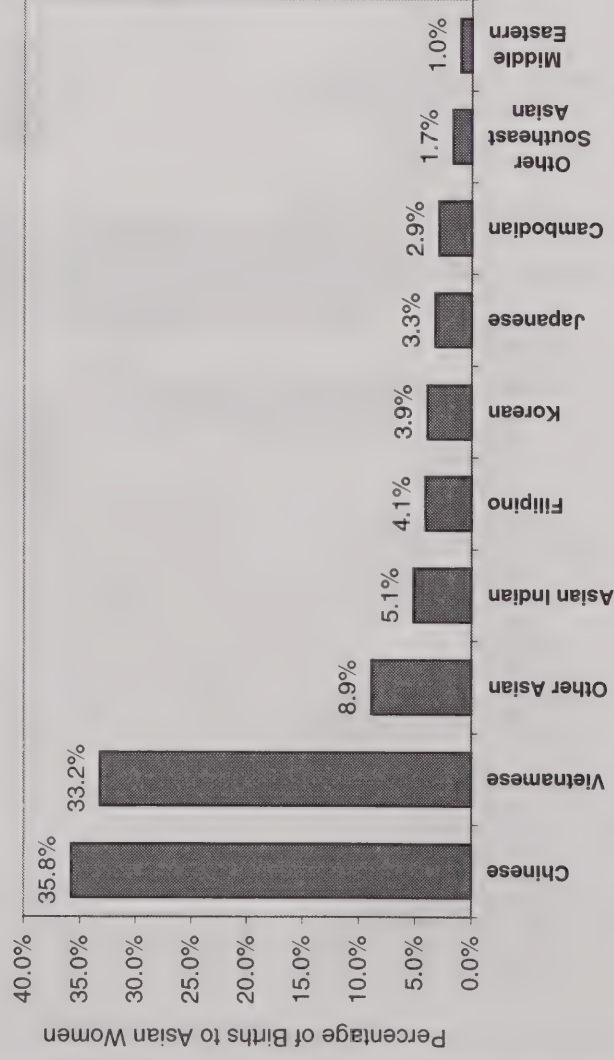
Percentage of Births to Asian Women

- The largest percentages of the 584 births to Asian women were to women of Chinese ancestry and those of Vietnamese ancestry.

- Other ancestries specified by Asian women who gave birth in 1999 were Other Asian, Asian Indian, Filipino, Korean, Japanese, Cambodian, Other Southeast Asian, or Middle Eastern.

MATERNAL CHARACTERISTICS

Maternal Age
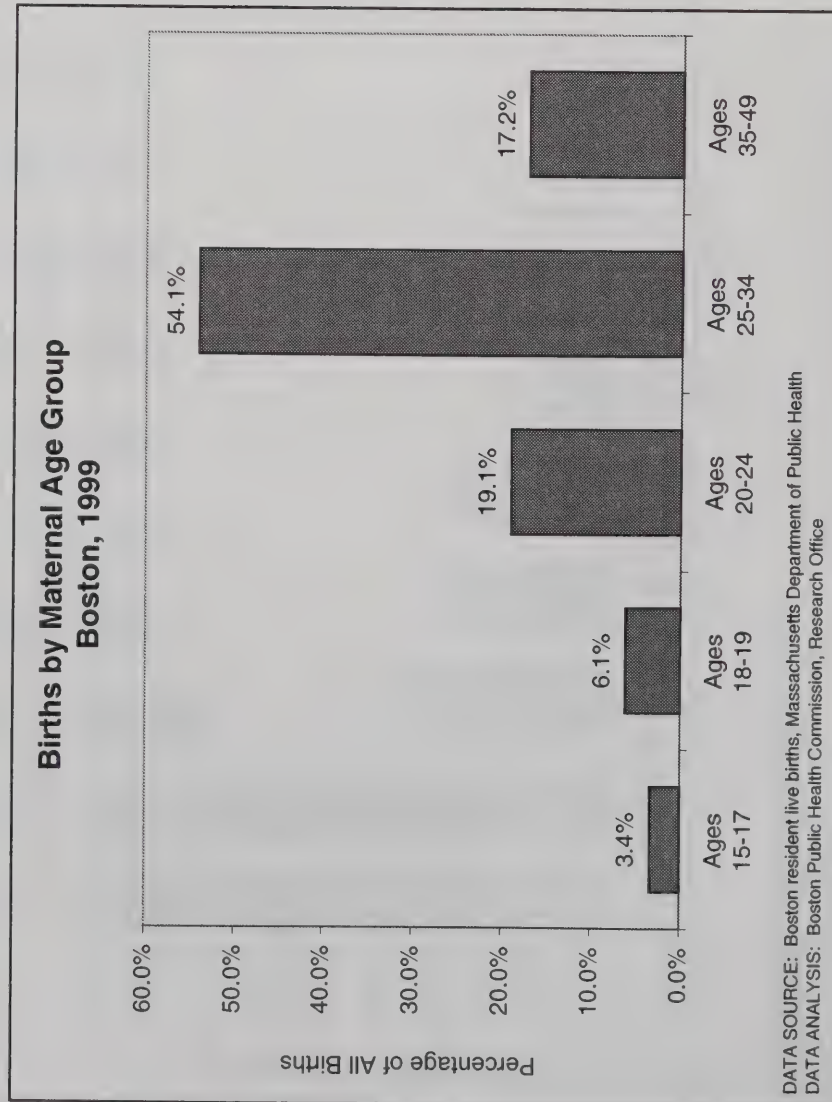
- In 1999, more than half of all births (4,334) occurred among women ages 25-34 years, and 775 births occurred among adolescents under age 20.

- Births to women ages 35-49 accounted for 1,380 births, and births to women ages 20-24 accounted for 1,528 births.

- Between 1991 and 1999, births to adolescents ages 15-17, as a percentage of all births, declined 1.2% and to adolescents ages 18-19 declined 0.5%; births to women ages 35-49, as a percentage of all births, increased 5.7%.

**Births by Maternal Age Group**
Boston, 1999

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

MATERNAL CHARACTERISTICS

Neighborhood

**Births by Neighborhood
Boston, 1999**

Percentage of Births

25.0%
20.0%
15.0%
10.0%
5.0%
0.0%

Allston/Brighton 7.7%
Back Bay 3.7%
Charles-town 2.6%
East Boston 8.7%
Fenway 1.7%
Hyde Park 6.7%
Jamaica Plain 5.6%
Mattapan 4.1%
North Dorchester 18.8%
North End 1.2%
Roslindale 6.7%
Roxbury 9.4%
South Boston 5.1%
South Dorchester 8.7%
South End 4.0%
West Roxbury 5.2%
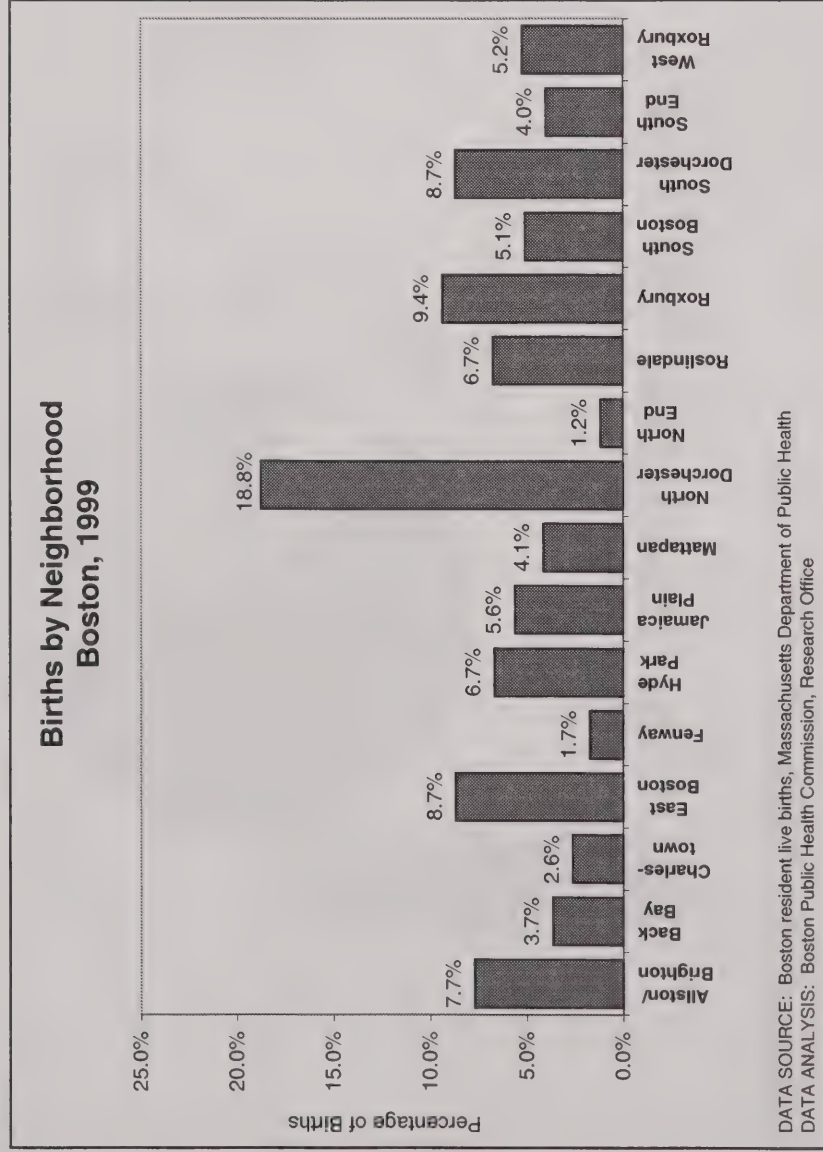
- Boston's largest neighborhood, North Dorchester, had the most births, 1,471, in 1999. Roxbury had the second-highest number, 735, and South Dorchester and East Boston had 681.

- The neighborhoods with the fewest births in 1999 were the North End (92 births) and the Fenway (137 births).

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

23

MATERNAL CHARACTERISTICS

Maternal Birthplace

**Births by Maternal Birthplace
Boston, 1999**
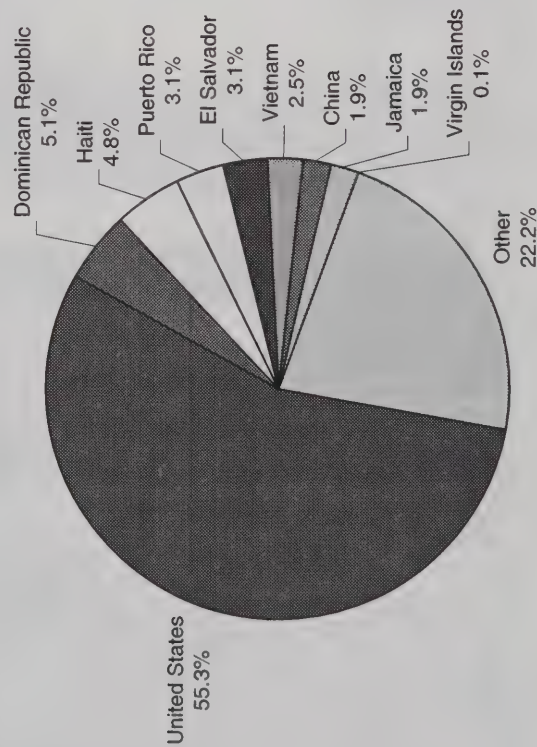
Pie chart: Births by Maternal Birthplace, Boston, 1999

- United States 55.3%
- Dominican Republic 5.1%
- Haiti 4.8%
- Puerto Rico 3.1%
- El Salvador 3.1%
- Vietnam 2.5%
- China 1.9%
- Jamaica 1.9%
- Virgin Islands 0.1%
- Other 22.2%

- Of the 8,017 births in 1999, 4,429 were to women born in the United States.

- Four hundred and five births were to women born in the Dominican Republic, 385 were to women born in Haiti, and 251 were to women born in Puerto Rico.

- Other maternal countries of origin, representing between one and three percent of all Boston births, were Virgin Islands, Jamaica, China, Vietnam, El Salvador, and Puerto Rico.

- Other countries, each with less than one percent of all births, collectively represented 22.2% of the Boston births in 1999.

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

MATERNAL CHARACTERISTICS

Language Preference

**Births by Maternal Language Preference
Boston, 1999**
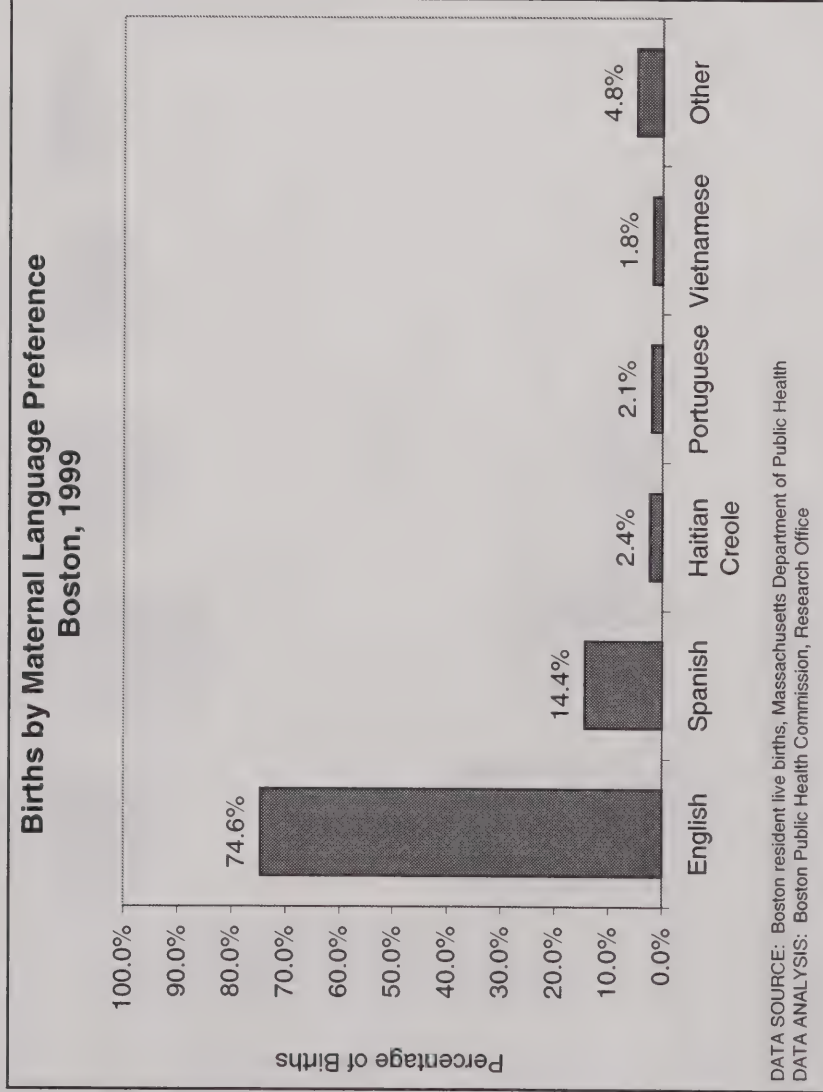
- In 1999, 5,973 Boston women reported English as their language of choice on the birth certificate.

- Spanish was the preferred language for 1,150 women.

- Haitian Creole, preferred by 190 women, and Portuguese, the language of choice of 166 women, were the next most common languages spoken by Boston women who gave birth in 1999.

- Other languages included American Sign, Arabic, Cambodian, Lao, Mandarin, Russian, and Vietnamese, each indicated by less than two percent of Boston women as their preferred language.

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

MATERNAL CHARACTERISTICS

Educational Attainment

**Births by Maternal Educational Attainment
Boston, 1999**
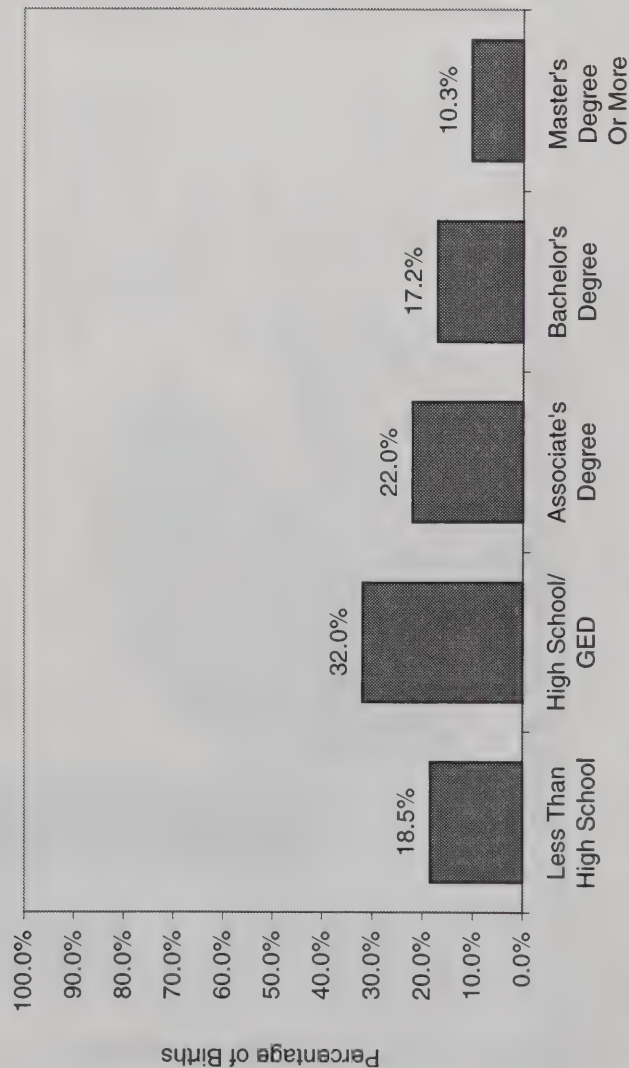
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%

Percentage of Births

18.5%	32.0%	22.0%	17.2%	10.3%
Less Than High School	High School/ GED	Associate's Degree	Bachelor's Degree	Master's Degree Or More

- Almost one in five Boston births in 1999 (18.5%) were to women who had less than a high school education.

- Another third (32.0%) were to women who had a high school diploma or equivalent, and the remainder (49.5%) were to women with at least some college education.

- Since 1991, the percentage of all births that were to women with less than a high school education has declined 32.5%; the percentage to women with a bachelor's degree has increased 42.1%, and the percentage to women with a master's degree or more, has increased 39.2%. Percentages of births to women at other levels of educational attainment have remained largely unchanged.

MATERNAL CHARACTERISTICS

Parity

Births by Parity
Boston, 1999
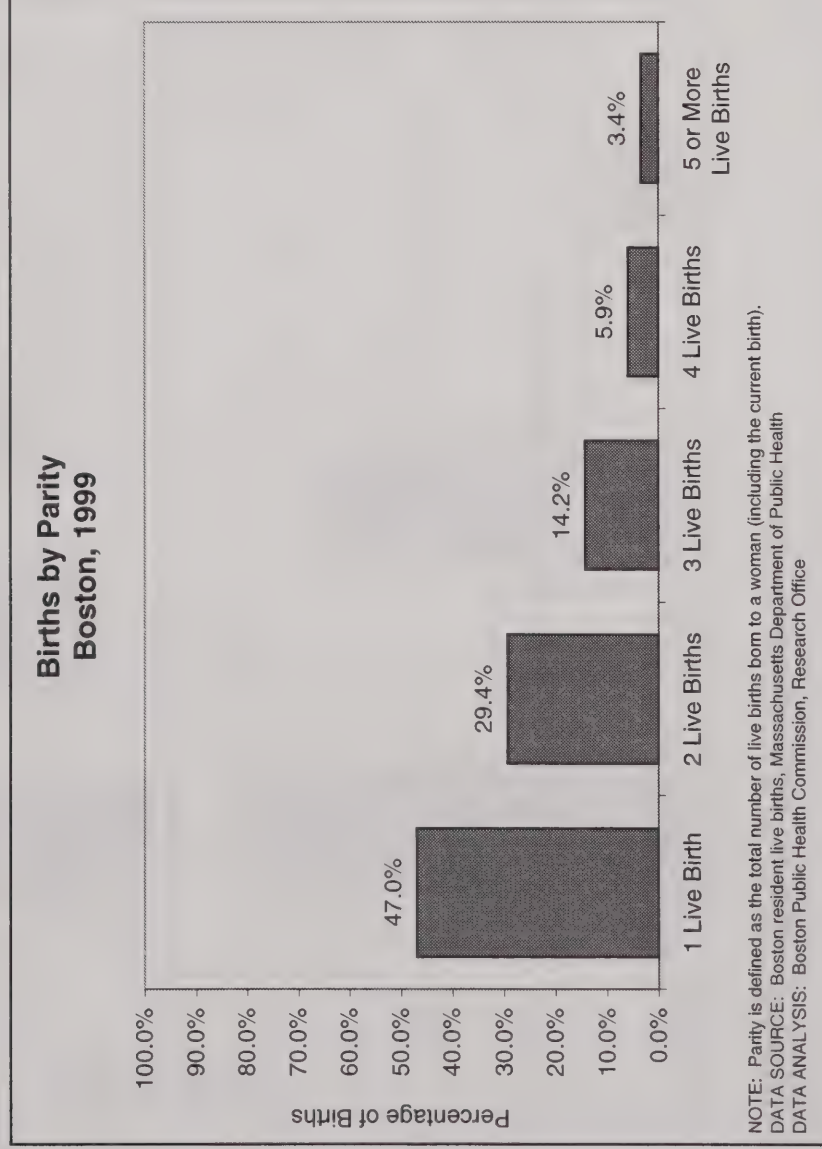
- First births accounted for 47.0% of births to Boston residents in 1999.

- Approximately thirty percent (29.4%) were to women having their second child; 14.2% were third births; 5.9% were fourth births; and the rest (3.4%) were to women with five or more children including the current birth.

- Over time, there have been small increases in women having their first or second births. Since 1991, first births as a percentage of all births increased 5.4%, and second births increased 3.5%. There have been decreases among higher-order births, the largest among fifth or higher-order births (26.1% decline).

NOTE: Parity is defined as the total number of live births born to a woman (including the current birth).
DATA SOURCE:: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

MATERNAL CHARACTERISTICS

Smoking During Pregnancy

The percentage of Boston women who report smoking during pregnancy continues to decline. In 1991, 17.0% said they smoked during their pregnancy. By 1999, only 6.7% reported doing so, a 60.6% decline since 1991.

- In 1999, smoking during pregnancy was more frequently reported by White women than by women of other racial/ethnicity groups. The White rate was 38.2% higher than the rate for Black women, almost two-and-a-half times the rate for Hispanic women, and more than four-and-a-half times the rate for Asian women.

- Between 1991 and 1999, smoking during pregnancy by White women fell 62.8%. Smoking during pregnancy by Black women declined 57.5%.

- There were slight decreases between 1998 and 1999 in the percentage of Hispanic women who reported smoking while pregnant, and the percentage of Asian women who reported smoking while pregnant fluctuated, due to small numbers.

Smoking During Pregnancy by Race/Ethnicity Boston, 1999

White 9.4%
Black 6.8%
Hispanic 3.9%
Asian 2.1%

Percentage of Births Within Race/Ethnicity

20.0%
15.0%
10.0%
5.0%
0.0%

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

18

MATERNAL CHARACTERISTICS

Smoking During Pregnancy

**Smoking During Pregnancy by Maternal Birthplace
Boston, 1999**

- Almost one in ten US-born women smoked while pregnant, compared with one in 12 women born in Puerto Rico.

- Women born in a country other than the US or Puerto Rico were less likely to smoke during pregnancy.

- Fewer than five women from each of the 32 countries other than the US and Puerto Rico, reported smoking during pregnancy.

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

MATERNAL CHARACTERISTICS

Smoking During Pregnancy

**Smoking During Pregnancy by Maternal Age
Boston, 1999**
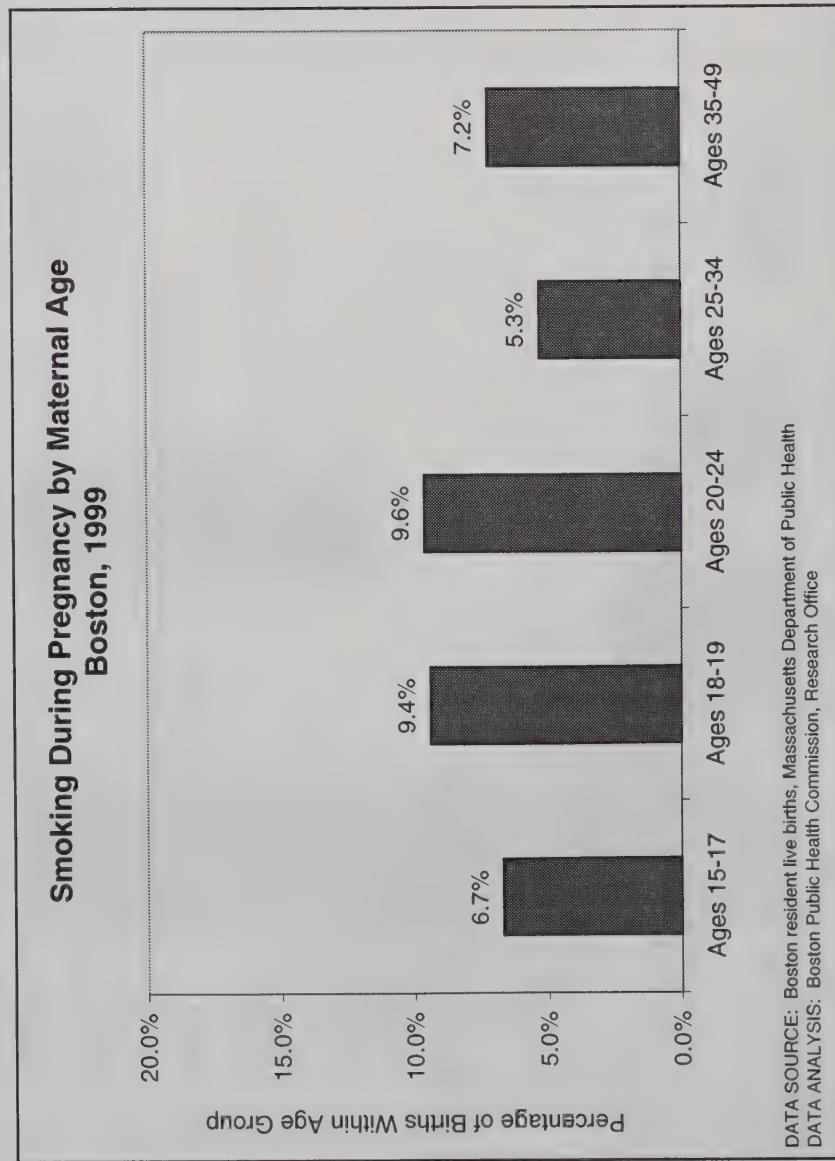
- During 1999, Boston residents most likely to smoke during pregnancy were those ages 20-24, followed by those ages 18-19, 35-49, and 15-17.

- The lowest level of smoking during pregnancy was among those ages 25-34.

- Between 1991 and 1999, the percentage of births that were to women who reported smoking during pregnancy declined for all age groups, except ages 20-24.

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

MATERNAL CHARACTERISTICS

Smoking During Pregnancy

**Smoking During Pregnancy by Maternal Education
Boston, 1999**
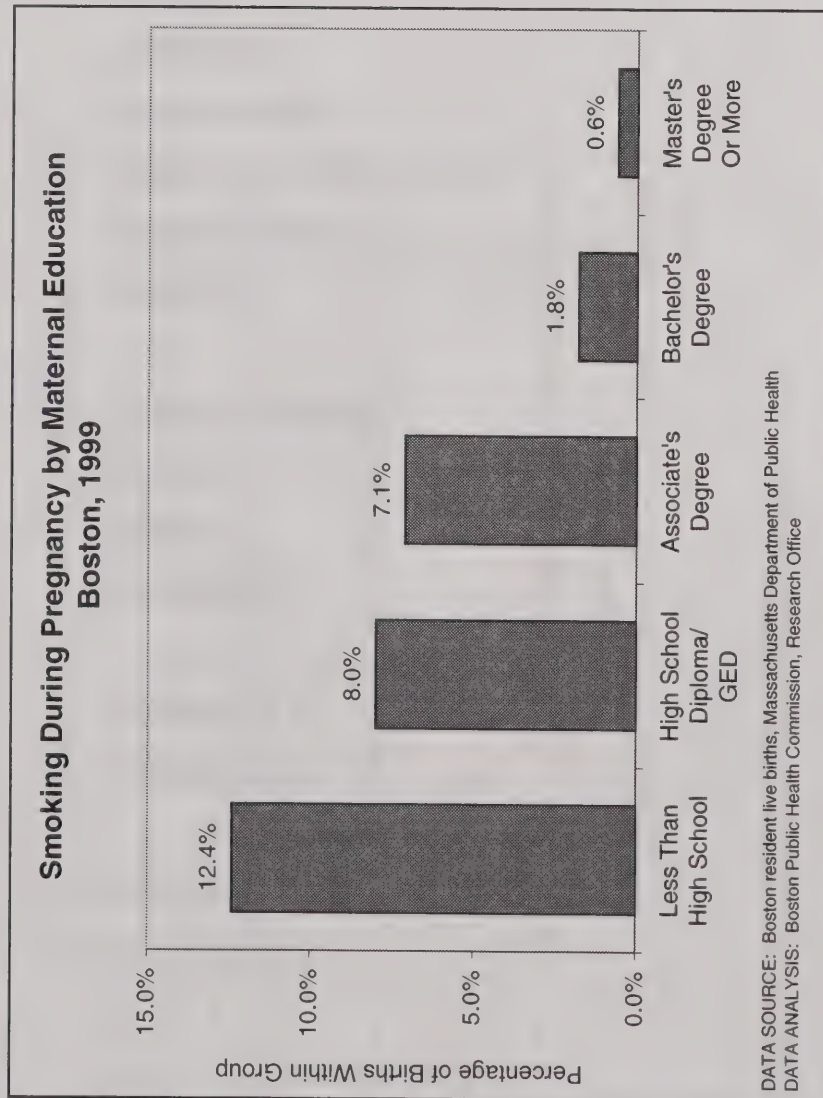
- In 1999, in Boston, smoking during pregnancy has a linear relationship to education, with smoking most common among women with less than a high school education, less frequent among those with a high school diploma or GED, and so on.

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

21

MATERNAL CHARACTERISTICS

Smoking During Pregnancy

Smoking During Pregnancy by Neighborhood Boston, 1999

Percentage of Births Within Neighborhood

- Boston 6.7%
- Allston/Brighton 4.5%
- Back Bay — Percentage Not Calculable
- Charlestown 7.3%
- East Boston 6.2%
- Fenway — Percentage Not Calculable
- Hyde Park 5.9%
- Jamaica Plain 3.7%
- Mattapan 4.0%
- North Dorchester 10.0%
- North End — Percentage Not Calculable
- Roslindale 5.0%
- Roxbury 8.6%
- South Boston 13.8%
- South Dorchester 8.0%
- South End 5.4%
- West Roxbury 3.9%

- Overall, 6.7% of Boston births in 1999 were to women who reported smoking during pregnancy. South Boston, North Dorchester, and Roxbury had the highest rates of reported smoking during pregnancy in 1999, and Jamaica Plain, West Roxbury, and Mattapan had the lowest rates. The Back Bay, the Fenway, and the North End each had fewer than five births to women who reported smoking.

NOTE: The numbers of women in the Back Bay, the Fenway, and the North End who reported smoking during pregnancy were too few to calculate a percentage for those neighborhoods.
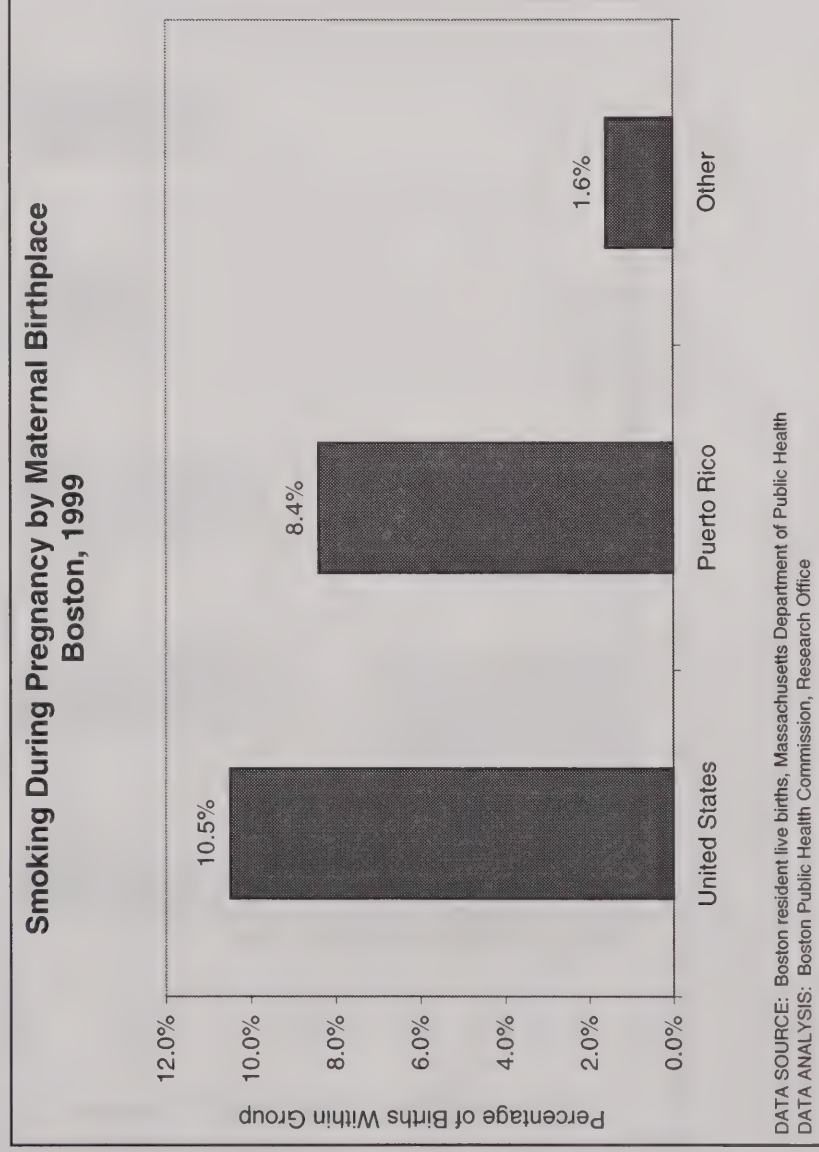DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

MATERNAL CHARACTERISTICS

Prenatal Care Payment Source

Source of Payment for Prenatal Care
Boston, 1999

Source of Payment	Percentage of Births
Private Insurance	**50.7%**
Blue Cross	5.6%
Commercial Insurance	10.9%
HMO	83.6%
Public Insurance	**48.2%**
Medicaid/Commonhealth	84.0%
Medicare	n<5
Healthy Start	7.7%
Other Government	7.9%
Free Care	0.3%
Other Insurance	**1.1%**
Worker's Compensation	n<5
Self Payer	41.2%
Other Specify	56.5%

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

- In 1999, payment for prenatal care for Boston births was almost evenly split between private insurers (for example, Blue Cross, commercial insurance, and HMOs) and publicly funded sources (for example, Medicaid/Commonhealth, the state Healthy Start program, other government programs, and the Uncompensated Care Pool).

- Other sources, neither public nor private, included worker's compensation, self-payer, and "other."

- Of prenatal care paid for by private insurance payers, most was paid for by HMOs.

- Of prenatal care paid for by public insurance payers, most was paid for by Medicaid/Commonhealth.

- For most years since 1991, private insurance has covered prenatal care for more births than were covered by public insurance. Only in 1994 and 1995 did this situation reverse. Since 1991, private insurance payment for prenatal care has declined 4.0%, and public insurance payment for prenatal care has increased 11.8% (data not shown).

MATERNAL CHARACTERISTICS

Adequacy of Prenatal Care

Currently two major indices are used for measuring adequacy of prenatal care: the Kessner Index and the Kotelchuck Index, also called the Adequacy of Prenatal Care Utilization (APNCU) Index.

The Kessner Index measures the adequacy of prenatal care in terms of number of prenatal visits and the point in pregnancy at which prenatal care was initiated, adjusted for the gestational age of the fetus at birth. The Kotelchuck Index, in addition, is able to distinguish prenatal care inadequacy due to a late start of prenatal care from inadequacy due to an insufficient number of visits, and to better characterize the adequacy of care for pregnancies of more than 36 weeks gestation. These indices produce somewhat different assessments of the adequacy of prenatal care among Boston women. The Kessner Index is used throughout this report.

- In 1999, 78.0% of Boston infants were born to women who received adequate prenatal care, as measured by the Kessner Index, an increase from 76.4% in 1998.

- Five percent of Boston infants were born to women who received inadequate or no prenatal care according to the Kessner scale.

Adequacy of Prenatal Care: Kessner Index Boston, 1999

Intermediate 16.8%

Inadequate 3.6%

None 0.5%

Adequate 79.2%

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

MATERNAL CHARACTERISTICS

Adequacy Of Prenatal Care

Adequacy of Prenatal Care* by Race/Ethnicity Boston, 1999

Percentage of Births Within Race/Ethnicity

White	85.3%	
Black	73.7%	
Hispanic	79.8%	
Asian	78.7%	
Other	63.2%	

- In 1999, adequate prenatal care was more common among White Boston women than women of other race/ethnicity groups.

- From 1998 to 1999, the percentage of women receiving adequate prenatal care increased for Whites, Blacks, Hispanics, and Asians.

- Black women had the greatest improvement, increasing from 65.2% in 1998 to 73.7% in 1999.

- In the "other" category, Cape Verdeans were the largest group, 52.9% of whom had adequate prenatal care. Others included Middle Easterners, Brazilians/Other Portuguese, and Native Americans.

*Based on the Kessner Index for adequacy of prenatal care
DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

MATERNAL CHARACTERISTICS

Adequacy Of Prenatal Care

Adequate Prenatal Care* by Maternal Birthplace
Boston, 1999

China 83.2%
Dominican Republic 90.1%
El Salvador 57.6%
Haiti 70.9%
Jamaica 84.0%
Puerto Rico 83.1%
United States 81.3%
Virgin Islands 100.0%
Vietnam 69.3%
Other 75.9%

Percentage of Births Within Group
100.0% 80.0% 60.0% 40.0% 20.0% 0.0%

- In 1999, Boston women born in the Virgin Islands had the highest level of prenatal care adequacy (although based on small numbers), followed by women born in the Dominican Republic, Jamaica, China, and Puerto Rico.

- The lowest levels of prenatal care adequacy were found among Boston women born in El Salvador, Vietnam, and Haiti.

- Among those born in the Unites States, White women had the highest level of prenatal care (86.2%), followed by Hispanic women (84.9%), Asian women (78.8%), and Black women (73.8%).

*Based on the Kessner Index for adequacy of prenatal care
DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

26

MATERNAL CHARACTERISTICS

Adequacy Of Prenatal Care

Adequacy of Prenatal Care* by Maternal Age
Boston, 1999

Percentage of Births Within Age Group

| Ages 15-17 | Ages 18-19 | Ages 20-24 | Ages 25-34 | Ages 35-49 |
| 66.8% | 72.7% | 74.6% | 81.1% | 83.0% |
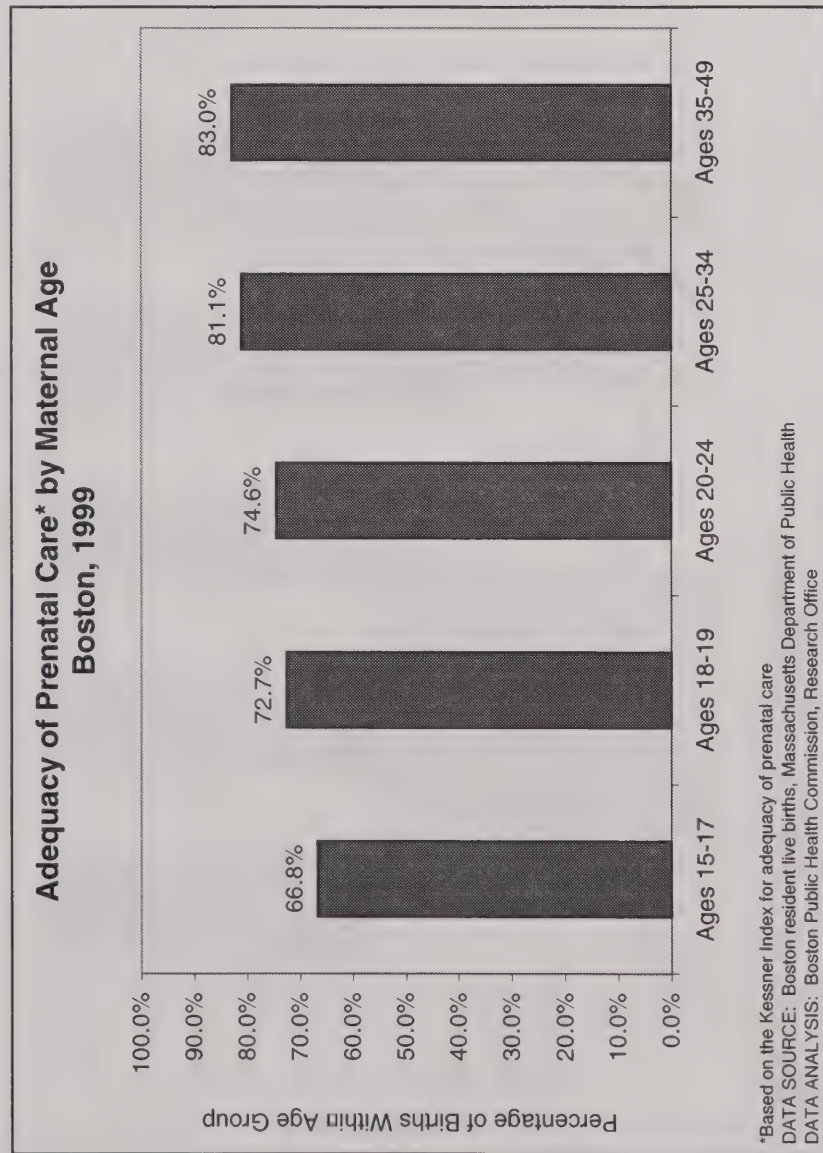
- Adequacy of prenatal care varies by age, with adolescents ages 15-17 the least likely to receive adequate prenatal care and women ages 25-34 and 35-49 the most likely.

- In 1999, 6.7% of Boston births to women under age 20 and 3.8% of births to women ages 20 and over involved inadequate or no prenatal care.

- Between 1998 and 1999, adequate prenatal care for Boston women under the age of 20 increased 3.5%, from 67.9% of births to 70.3%.

*Based on the Kessner Index for adequacy of prenatal care
DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

MATERNAL CHARACTERISTICS

Adequacy of Prenatal Care

**Adequacy of Prenatal Care* by Maternal Education
Boston, 1999**

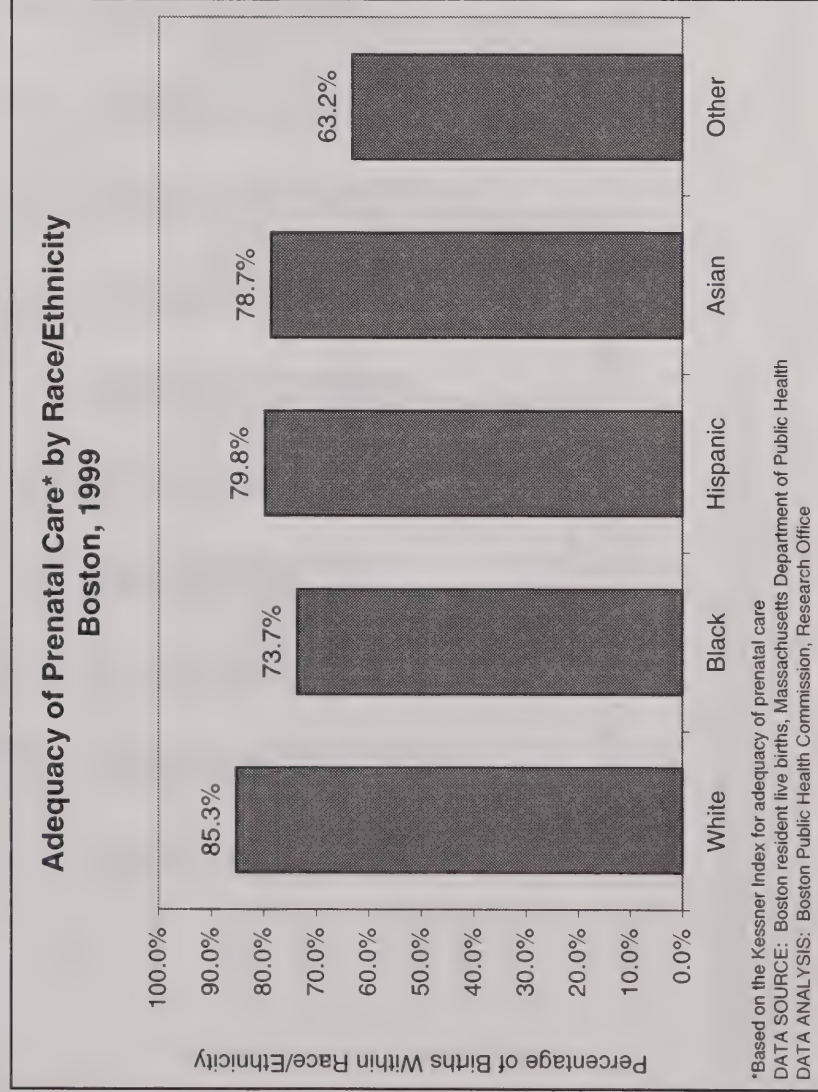*Based on the Kessner Index for adequacy of prenatal care
DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

- Generally, adequacy of prenatal care increases with the level of education achieved.

- Boston women with less than a high school education were least likely to receive adequate prenatal care.

28

MATERNAL CHARACTERISTICS

Adequacy of Prenatal Care

Adequacy of Prenatal Care* by Maternal Smoking Status
Boston, 1999
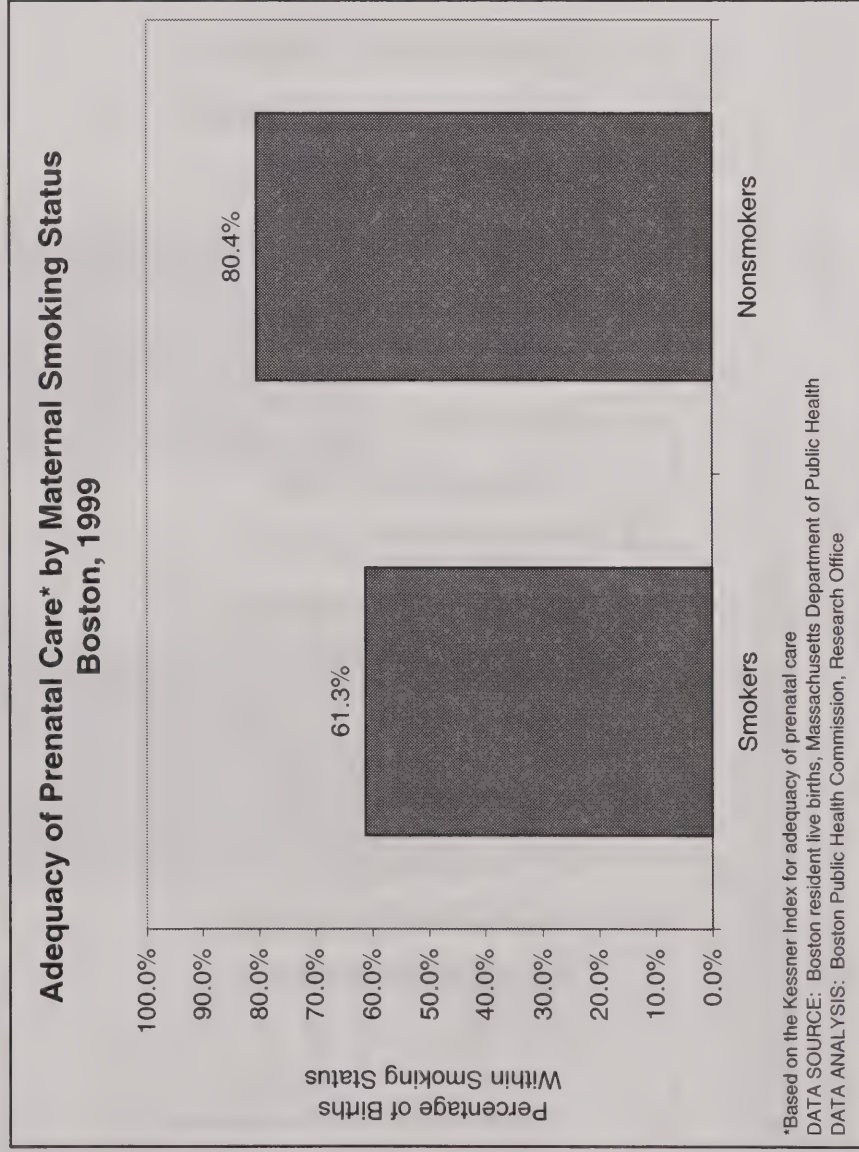
- During 1999, adequate prenatal care was less common among births to Boston women who reported smoking during pregnancy.

- The percentage of Boston births with inadequate or no prenatal care (10.8%) was also higher for women who reported smoking during pregnancy than those who did not (3.6%).

*Based on the Kessner Index for adequacy of prenatal care
DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

29

MATERNAL CHARACTERISTICS

Adequacy of Prenatal Care

Adequate Prenatal Care* by Payer
Boston, 1999
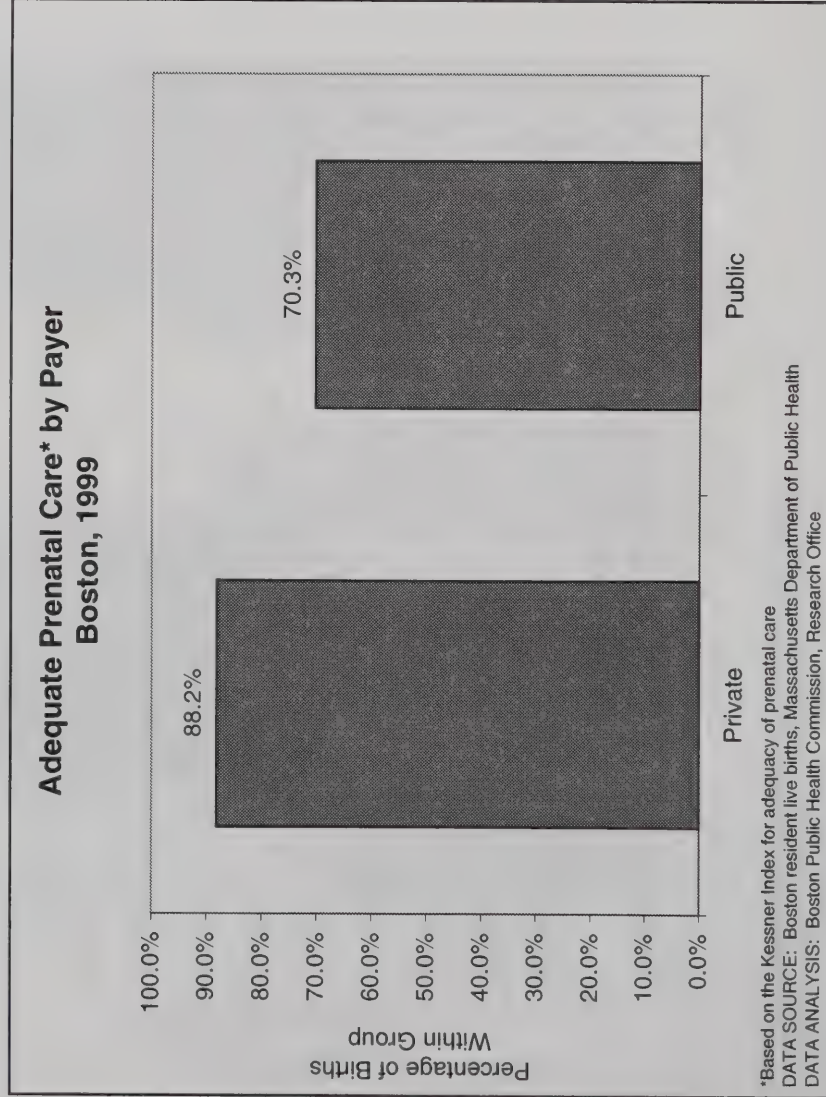
- In 1999, adequate prenatal care was more common among Boston births to women whose prenatal care was paid for by private insurers than among women whose prenatal care was paid for by publicly funded sources such as Medicaid, Medicare, state Healthy Start, other public programs, or the Uncompensated Care Pool.

*Based on the Kessner Index for adequacy of prenatal care
DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

MATERNAL CHARACTERISTICS

Adequacy of Prenatal Care

- Adequacy of prenatal care varies by Boston neighborhood. In 1999, the percentage of births to women who received adequate prenatal care ranged from a high of 90.1% in Jamaica Plain to a low of 67.1% in East Boston.

- The highest levels of prenatal care adequacy were in Jamaica Plain, the Fenway, West Roxbury, the Back Bay, Charlestown, Roslindale, the North End, and South Boston. The lowest levels of adequate prenatal care occurred in East Boston, North Dorchester, and Roxbury.

Adequate Prenatal Care* by Neighborhood
Boston, 1999

*Based on the Kessner Index for adequacy of prenatal care
DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

31

MATERNAL CHARACTERISTICS

Delivery Method

**Births by Method of Delivery
Boston, 1999**
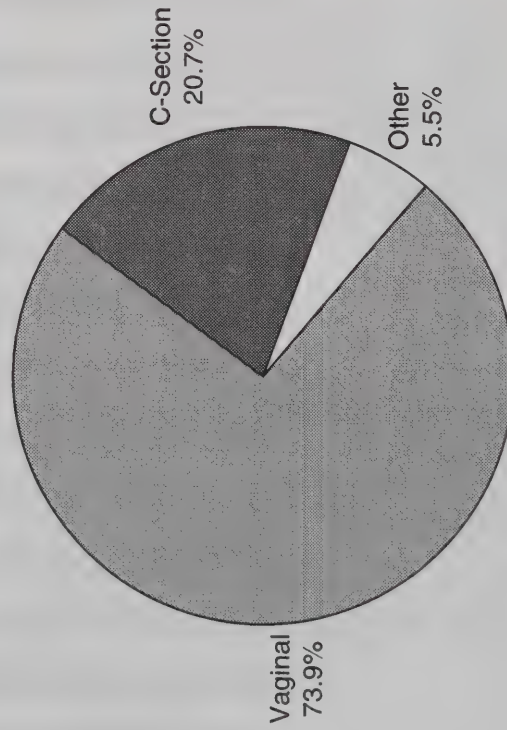
Vaginal
73.9%

C-Section
20.7%

Other
5.5%

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

- Almost three quarters of births to Boston women during 1999 were by vaginal delivery. This was unchanged from 1998.

- Births by cesarean section delivery accounted for 20.7% in 1999, up slightly from 19.4% in 1998.

- Other methods, such as vacuum and forceps, accounted for the remainder of deliveries.

INFANT CHARACTERISTICS

Multiple Births Trends

**Multiple Births by Year
Boston, 1991-1999**
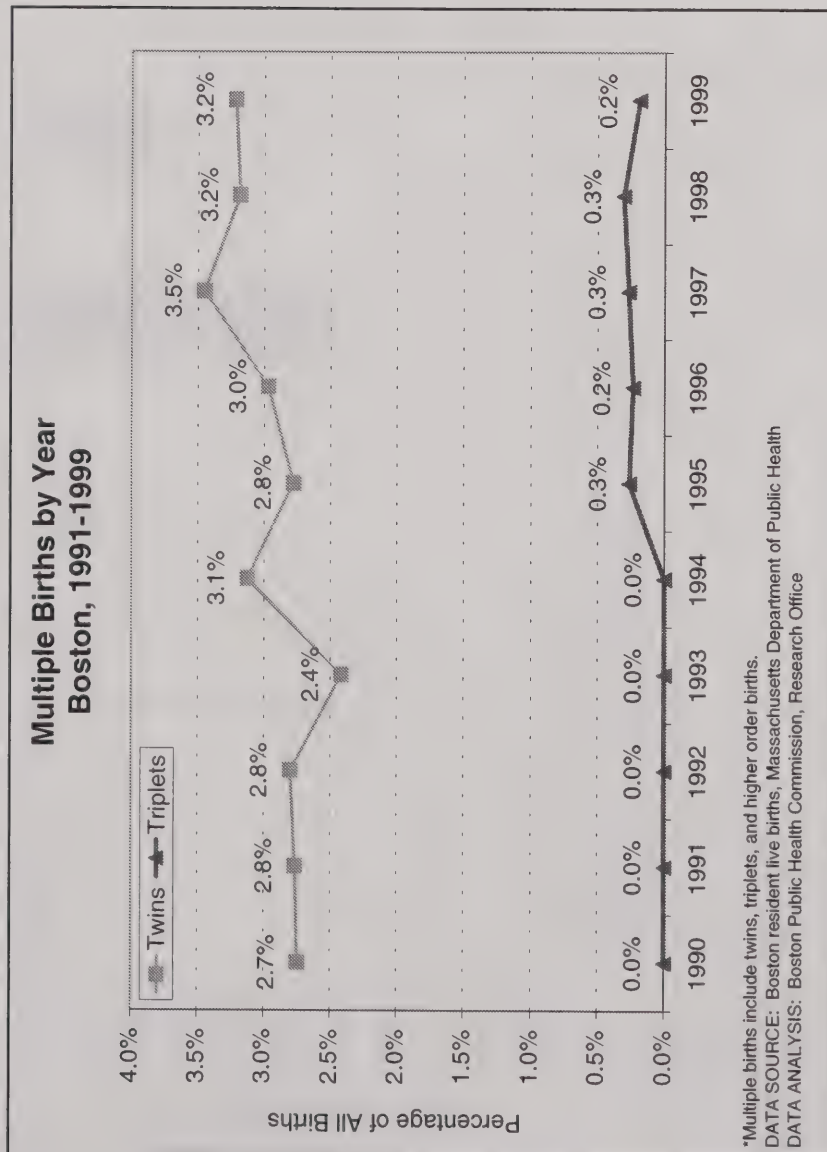
- The overall multiple birth rate in Boston increased from 2.8% in 1991 to 3.4% in 1999.

- In Boston, in 1999, 3.2% of births were twin births, compared to 3.5% in 1997, and 2.8% in 1991. In Boston, the frequency of twin births as a percentage of all births has increased 14.3% since 1991.

- On the other hand, the percentage which were triplets rose from zero in 1991 to 0.3% in 1995 and has remained relatively stable since then.

*Multiple births include twins, triplets, and higher order births.
DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

33

INFANT CHARACTERISTICS

Multiple Births

Multiple Births* by Maternal Age
Boston, 1999
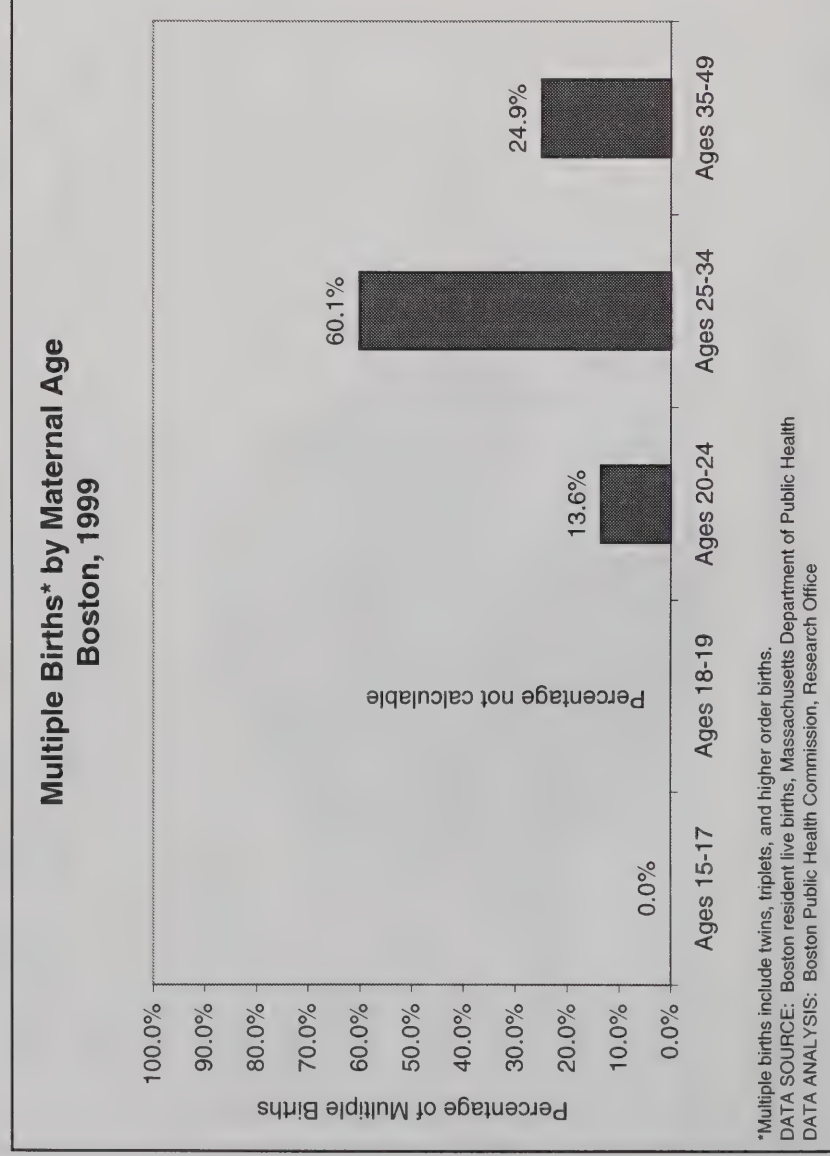
- Eighty-five percent of Boston's multiple births during 1999 were to women ages 25-49. Women in younger age groups made up the balance.

- There were too few multiple births to females ages 18-19 to calculate a rate and no multiple births to females ages 15-17.

Chart showing Percentage of Multiple Births by age group:
- Ages 15-17: 0.0%
- Ages 18-19: Percentage not calculable
- Ages 20-24: 13.6%
- Ages 25-34: 60.1%
- Ages 35-49: 24.9%

*Multiple births include twins, triplets, and higher order births.
DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

INFANT CHARACTERISTICS

Multiple Births

Multiple Births (Twins or More) by Race/Ethnicity of the Mother Boston, 1990-2000
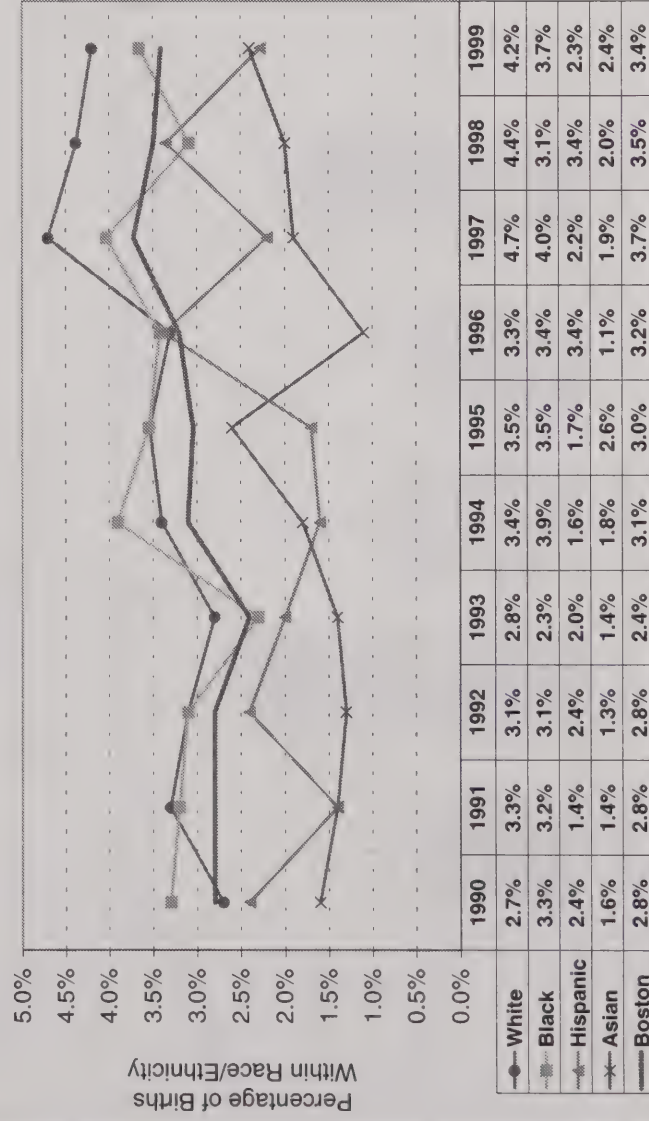
Percentage of Births Within Race/Ethnicity

|	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
White	2.7%	3.3%	3.1%	2.8%	3.4%	3.5%	3.3%	4.7%	4.4%	4.2%
Black	3.3%	3.2%	3.1%	2.3%	3.9%	3.5%	3.4%	4.0%	3.1%	3.7%
Hispanic	2.4%	1.4%	2.4%	2.0%	1.6%	1.7%	3.4%	2.2%	3.4%	2.3%
Asian	1.6%	1.4%	1.3%	1.4%	1.8%	2.6%	1.1%	1.9%	2.0%	2.4%
Boston	2.8%	2.8%	2.8%	2.4%	3.1%	3.0%	3.2%	3.7%	3.5%	3.4%

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

- The percentage of multiple births varied by race/ethnicity. In 2000, White and Black women had the highest percentages while Hispanics and Asians had the lowest percentages.

- Between 1998 and 1999, the multiple birth rate increased for Black and Asian women. For Blacks the increase was 19.4% and for Asian 20.0%. Decreases were seen among Hispanic (32.4%) and White women (4.5%).

- The percentage of women having multiple births fluctuates yearly, but overall there has been an increase in women having multiple births between 1990 and 1999.

- Between 1990 and 1999, the percentage of women having multiple births increased for most races and ethnicities. The largest increase was observed among White (55.6%) and Asian (50.0%) women. Blacks had an increase of 12.1% in multiple births between 1990 and 1999.

- There were yearly fluctuations in the percentage of multiple births for Hispanic women, but between 1990 and 1999, the percentage remained the same.

INFANT CHARACTERISTICS

Low Birthweight

Low Birthweight Births by Year
Boston, 1991-1999
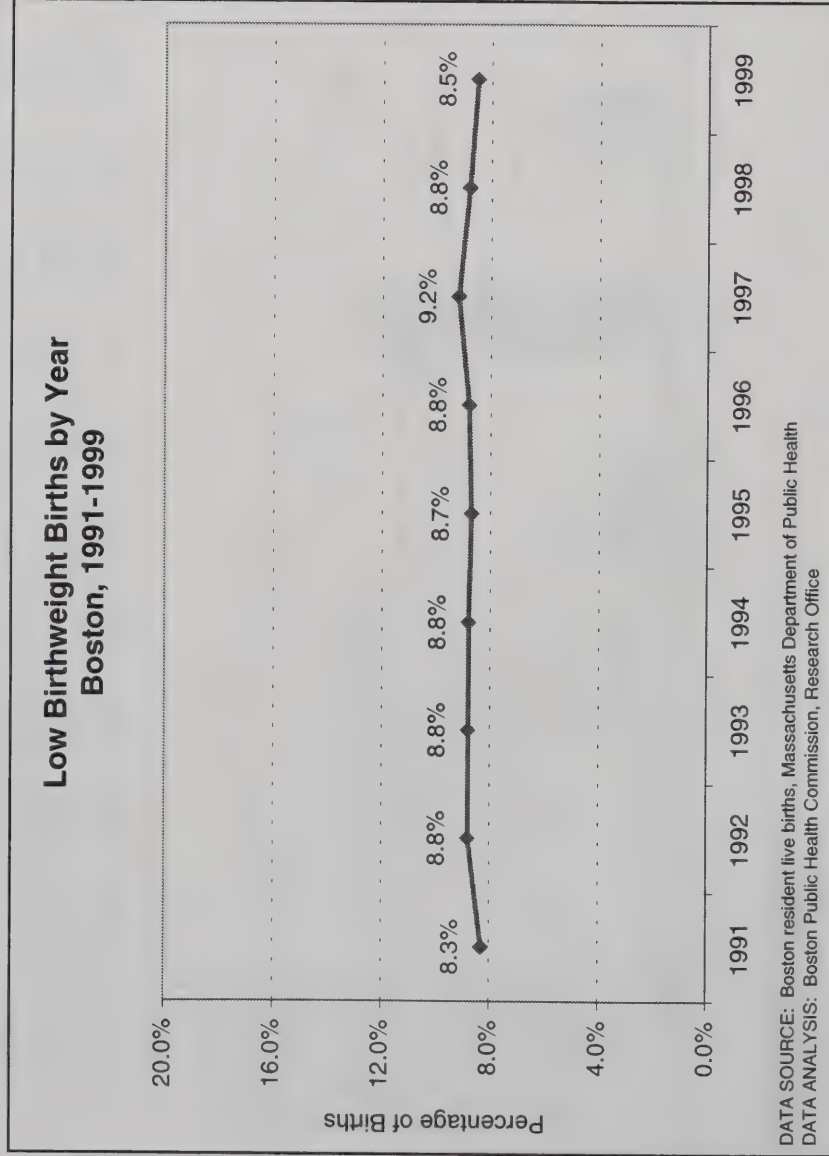
- In 1999 in Boston, 679 births (8.5%) were low birthweight (LBW), or less than 2,500 grams (5.5 pounds) at delivery.

- The 1999 LBW rate represents a 3.4% decline from the rate in 1997 (9.2%).

- Between 1991 and 1999, the LBW rate for Boston births has fluctuated from a low of 8.3% (in 1991) to a high of 9.2% (in 1997).

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

INFANT CHARACTERISTICS

Low Birthweight

Low Birthweight Births by Race/Ethnicity
Boston, 1999

Percentage of Births
Within Race/Ethnicity
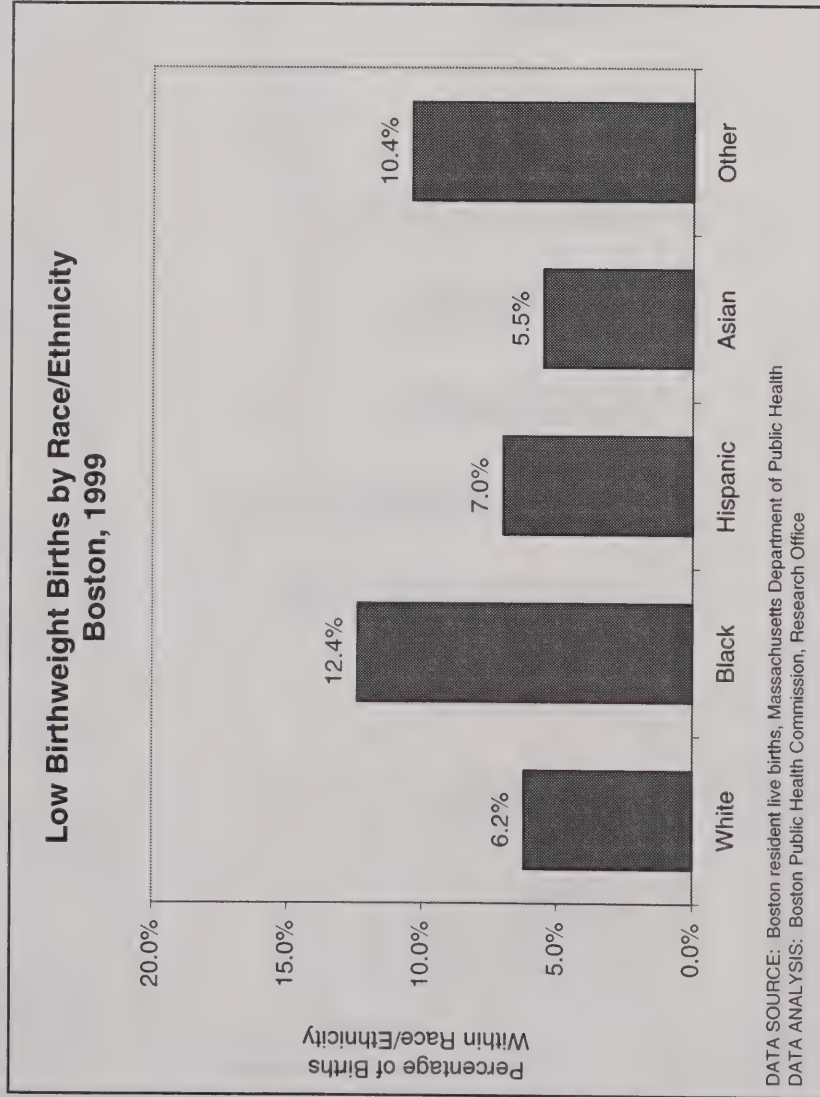
- In 1999 the low birthweight rate for Black infants was twice that of Whites, and 77.1% higher than that of the next highest racial/ethnic group in Boston, Hispanics.

- In the "other" category, Cape Verdeans had a low birthweight rate of 10.5%. All other races and ethnicities in this category had fewer than five occurences.

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

INFANT CHARACTERISTICS

Low Birthweight

Low Birthweight Births by Race/Ethnicity and Year Boston, 1991-1999

	1991	1992	1993	1994	1995	1996	1997	1998	1999
White	6.2%	5.9%	6.1%	5.8%	6.5%	5.7%	7.1%	6.4%	6.2%
Black	12.1%	13.0%	12.6%	13.0%	11.9%	13.1%	12.3%	12.5%	12.4%
Hispanic	6.2%	7.1%	8.0%	7.8%	7.3%	8.6%	8.1%	8.1%	7.0%
Asian	5.9%	6.1%	4.1%	5.6%	7.1%	6.1%	7.7%	7.5%	5.5%
All of Boston	8.3%	8.8%	8.8%	8.8%	8.7%	8.8%	9.2%	8.8%	8.5%

Percentag of Births Within Race/Ethnicity

- The LBW rate for Black infants has not changed significantly since 1991 and has consistently been the highest of Boston race/ethnicity groups over time.

- The LBW rates for Whites and Hispanics have remained relatively stable since 1991. The White LBW rate has fluctuated between 6.2% in 1991 and 7.1% in 1997, and the Hispanic LBW rate has fluctuated between 6.2% in 1991 and 8.6% in 1996.

- The LBW rate for Asian infants has fluctuated from a low of 4.1% in 1993 to a high of 7.7% in 1997.

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

INFANT CHARACTERISTICS
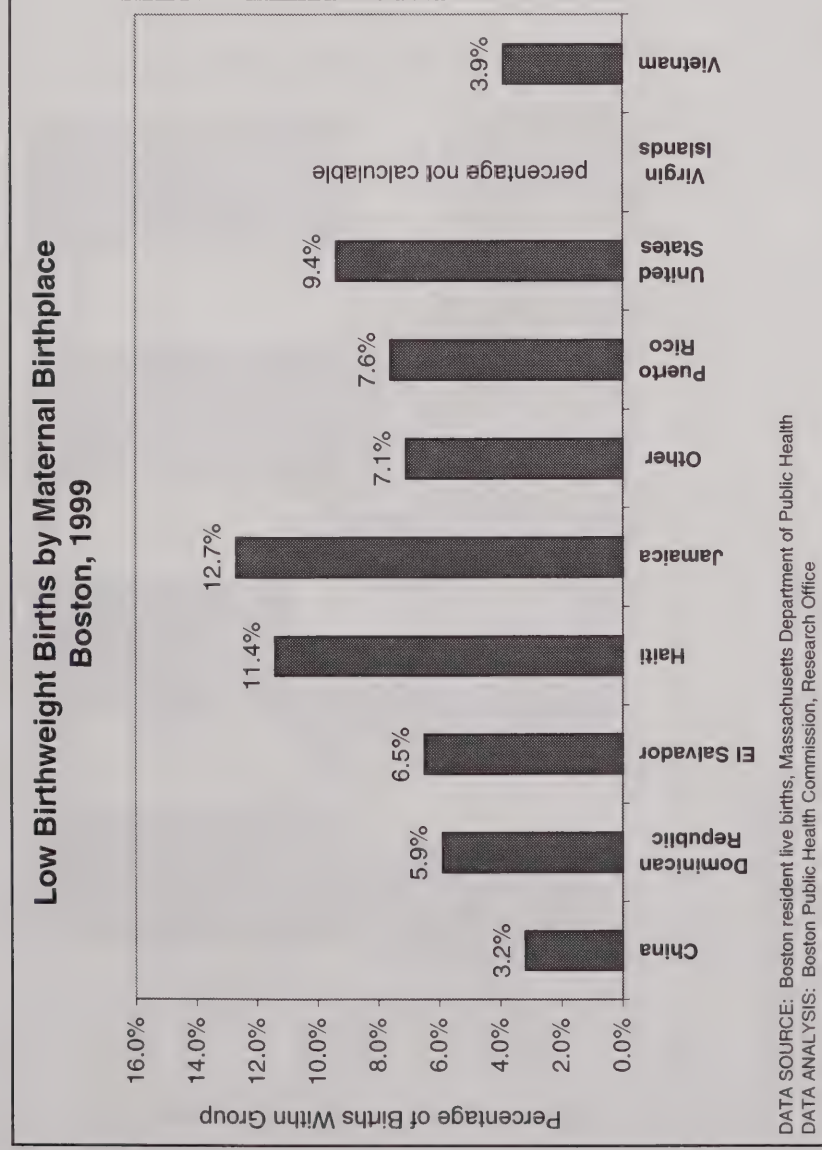
Low Birthweight

- In 1999, births to Boston women born in Haiti or Jamaica had a higher low birthweight rate than births to women born in the US. (For these purposes, the US comprises the fifty states only; US territories are considered separately.)

- LBW rates in 1999 were lowest among births to women born in China, Vietnam, and the Dominican Republic.

- Among those born in the United States, Black woman had the highest level of low birthweight births (13.6%), followed by Hispanic women (9.2%) and White women (6.7%). There were too few low birthweight births among Asian women to calculate a rate.

**Low Birthweight Births by Maternal Birthplace
Boston, 1999**

Maternal Birthplace	Percentage
China	3.2%
Dominican Republic	5.9%
El Salvador	6.5%
Haiti	11.4%
Jamaica	12.7%
Other	7.1%
Puerto Rico	7.6%
United States	9.4%
Virgin Islands	percentage not calculable
Vietnam	3.9%

Percentage of Births Within Group (y-axis: 0.0% to 16.0%)

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

INFANT CHARACTERISTICS

Low Birthweight

**Low Birthweight Births by Maternal Age
Boston, 1999**

- LBW rates in Boston are consistent with the pattern in the US, where the highest LBW rates are found among the youngest and older women. In Boston in 1999, the highest LBW rate was among women ages 35-39, whereas in the US the highest was among women over age 40.

- In 1999, a higher percentage of births to Boston women under 20 years of age or over 35 years of age were low birthweight than were births to women between the ages of 20 and 34.

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

INFANT CHARACTERISTICS

Low Birthweight

**Low Birthweight Births by Maternal Education
Boston, 1999**
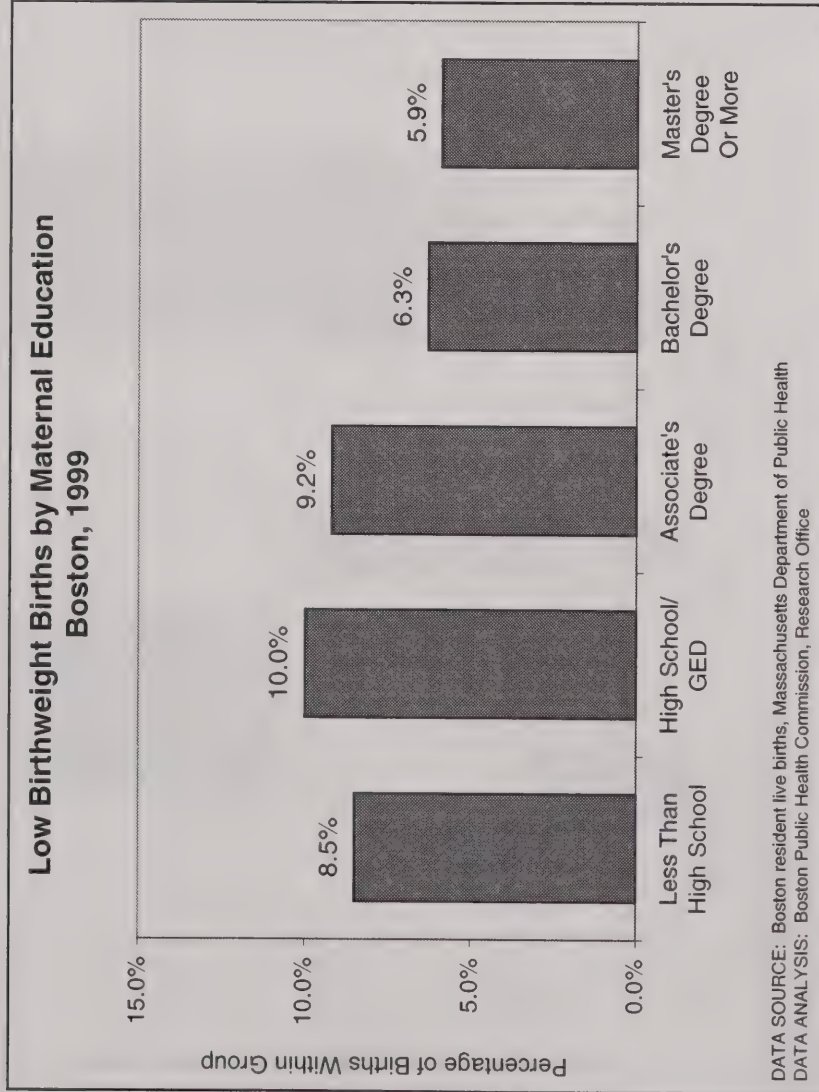
- Women with less education generally have higher rates of LBW than those with more education. However, this was not the case among women with less than a high school education in Boston in 1999.

- In Boston in 1999, 8.5% of births to women with less than a high school diploma were LBW, compared with 5.9% of births to women with a master's degree or higher education.

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

INFANT CHARACTERISTICS

Low Birthweight

Low Birthweight Births by Maternal Smoking Status Boston, 1999
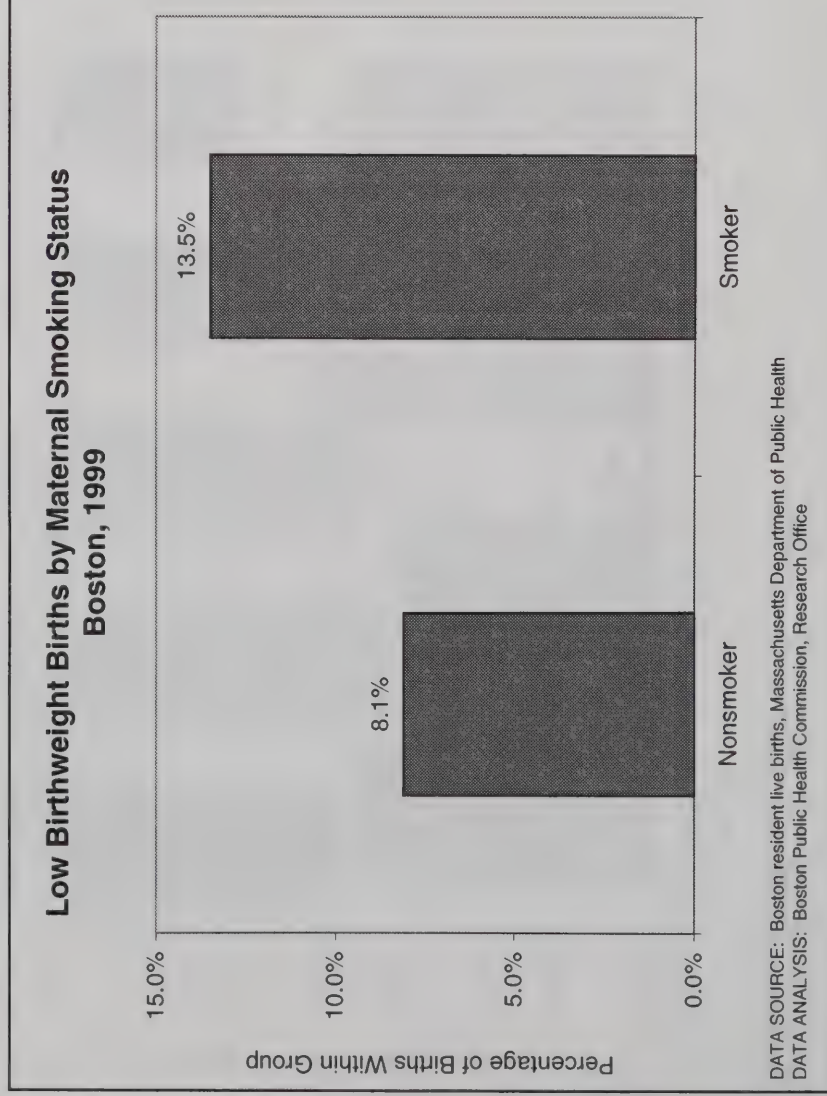
- Tobacco use by women during pregnancy is associated with a variety of health risks, including miscarriage, intrauterine growth retardation, low birthweight, and infant mortality, as well as negative consequences for child health and development.*

- In Boston in 1999, the LBW rate for the infants of women who smoked during pregnancy was 66.7% higher than the rate for infants whose mother did not smoke.

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

* US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics. National Vital Statistics Reports, Births: Final Data for 1998. Vol. 48. Number 3, p.11.

INFANT CHARACTERISTICS

Low Birthweight

Low Birthweight Births by Smoking and Race/Ethnicity Boston, 1999

Percentage of Low Birthweight Births

| | Non-smoking | Smoking |

White: 6.0%, 8.7%
Black: 11.8%, 21.5%
Hispanic: 6.7%, 13.4%
Asian: 5.4%, percentage not calculable
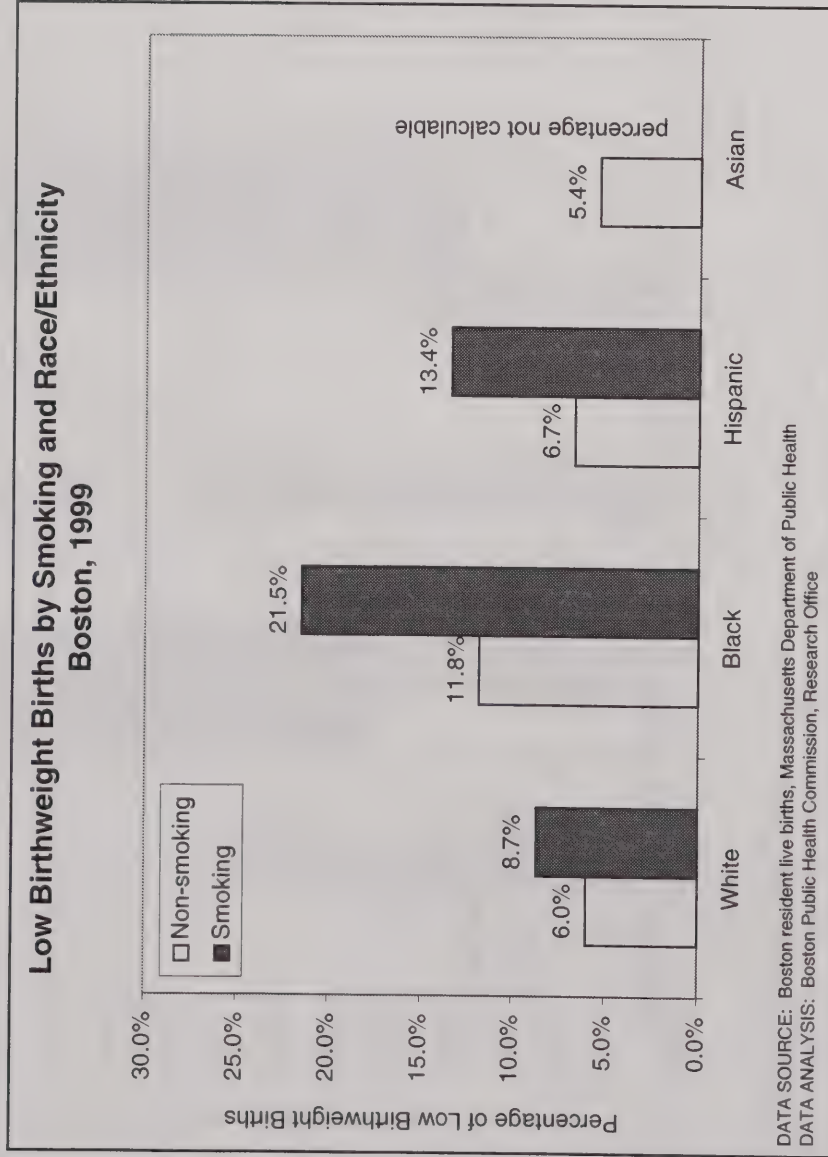
- Among all races and ethnicities except Asians, a higher percentage of women who smoke gave birth to a low birthweight infant than those who do not.

- Among Boston women who smoked during pregnancy, a higher percentage of Black women gave birth to low birthweight infants than women of other races. Among Black Boston women who smoke, 21.5% of all births were low birthweight, and among Boston Hispanic women, 13.4% were LBW. Among Black and Hispanic women, women who smoke are almost twice as likely to give birth to low birthweight infants than women who do not smoke.

- Among Asian women who smoke, there were too few low birthweight infants to calculate a rate.

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

43

INFANT CHARACTERISTICS

Low Birthweight

Low Birthweight Births by Smoking and Maternal Birthplace
Boston, 1999
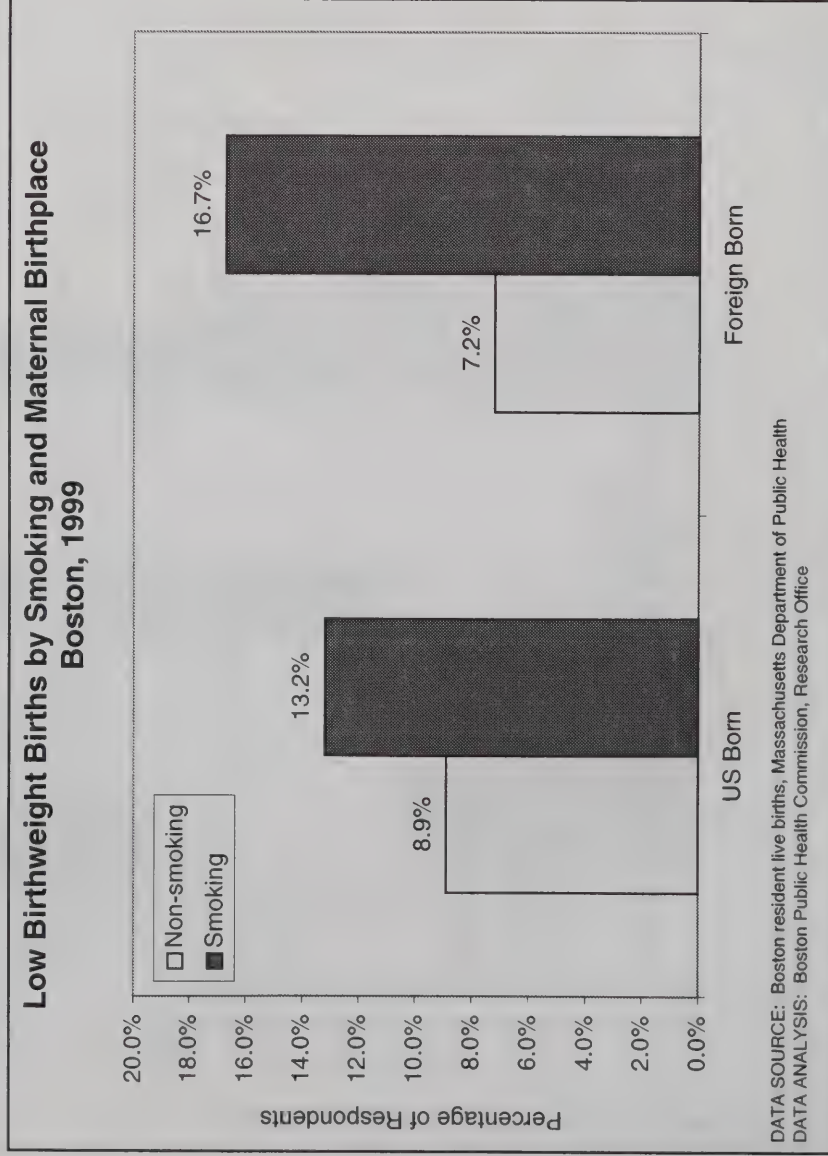
- In 1999, Boston women born in the United States, including US territories, and those born elsewhere who reported smoking during pregnancy experienced a higher percentage of low birthweight births than women who did not report smoking during pregnancy.

- The percentage of low birthweight births was 26.5% higher among Boston women who smoked during pregnancy who were born outside the United States than among those who were US-born.

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

44

INFANT CHARACTERISTICS

Low Birthweight

**Low Birthweight Births by Smoking and Maternal Education
Boston, 1999**
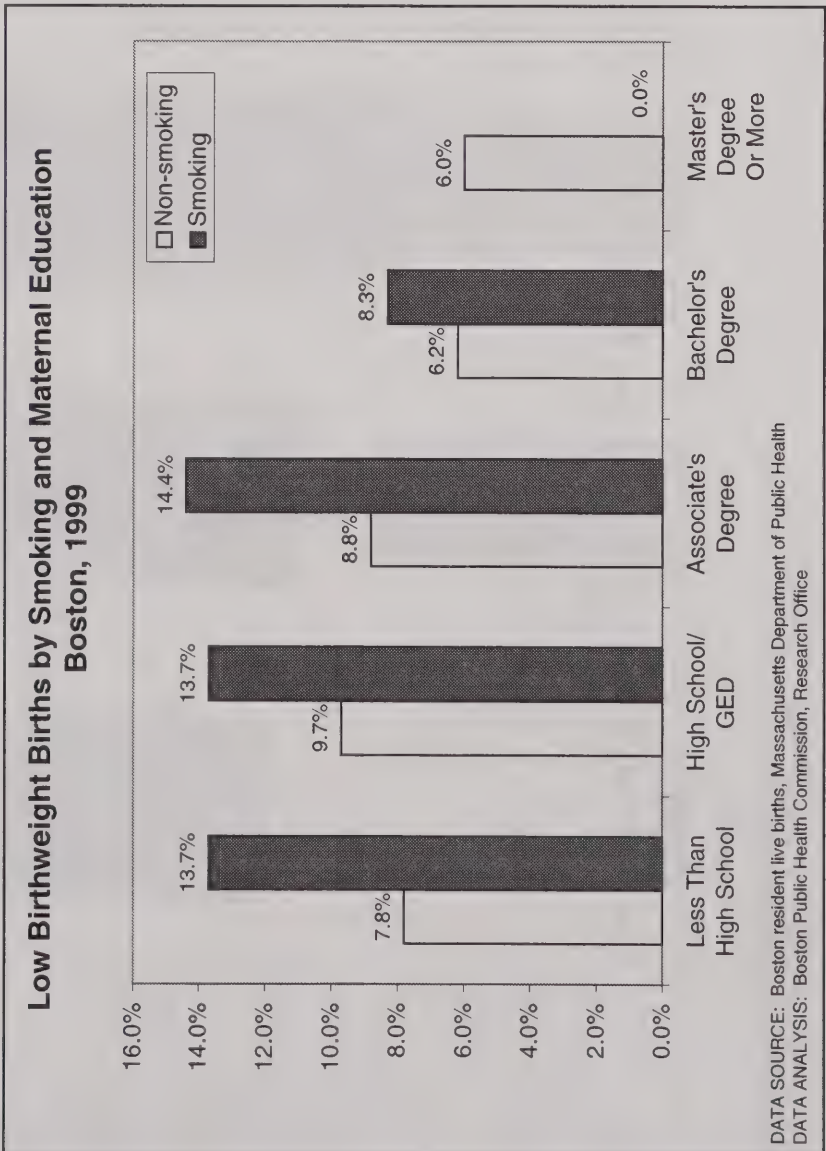
- At every educational level except master's degree or higher education, women who smoked during pregnancy had a higher rate of LBW than those who did not.

- A higher percentage of women who had an associate's degree or less education had a low birthweight birth than women who had completed college.

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

45

INFANT CHARACTERISTICS

Low Birthweight

Low Birthweight Births by Prenatal Care Adequacy
Boston, 1999

Percentage of Births Within Group
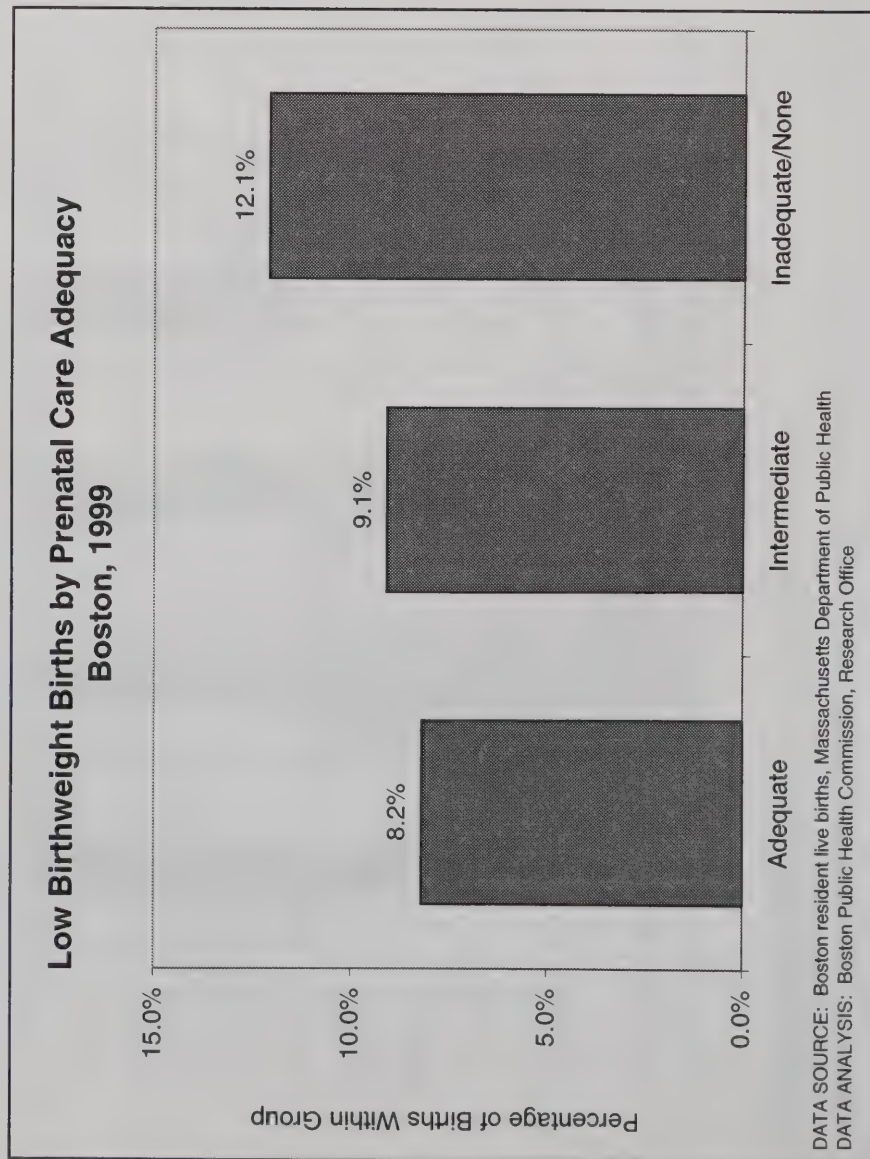
- Infants born to women who do not receive adequate prenatal care have an elevated risk of low birthweight.

- In Boston in 1999, 8.2% of births to women who had adequate prenatal care were LBW, compared with 9.1% of births to women whose care was intermediate in adequacy and 12.1% of births to women who had inadequate or no prenatal care.

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

INFANT CHARACTERISTICS

Low Birthweight

**Low Birthweight Births by Plurality
Boston, 1999**
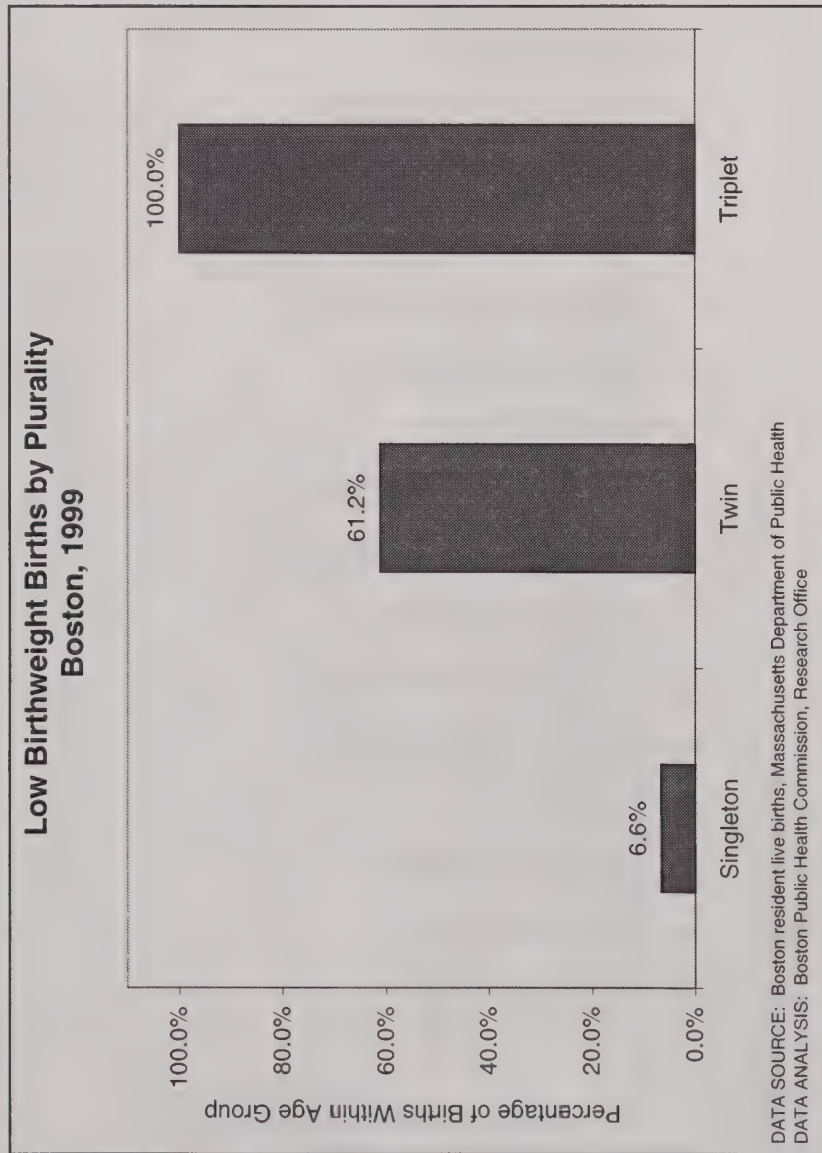
- The risk of low birthweight increases with plurality. While only seven percent of singleton births in 1999 were LBW, among multiple births 61.2% of twins and 100.0% of triplets were LBW.

- In 1999, 63.4% of Boston multiple births were low birthweight.

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

INFANT CHARACTERISTICS

Low Birthweight

Low Birthweight Births by Plurality and Year
Boston, 1991-1999

	1991	1992	1993	1994	1995	1996	1997	1998	1999
Singleton	7.0%	7.4%	7.5%	7.4%	7.1%	7.4%	7.2%	7.0%	6.6%
Twins	54.4%	56.2%	61.8%	52.5%	55.4%	51.1%	58.5%	57.8%	61.2%
Triplets					85.7%	72.2%	90.5%	83.3%	100.0%

Percentage of Births Within Multiple Category

- Between 1991 and 1999, low birthweight among singletons remained at about 7.0%. Low birthweight among twins was 12.5% higher in 1999 than in 1991.

- No triplets were born to Boston residents during the years 1991 through 1994; between 1995 and 1999, the percentage of low birthweight among triplets ranged from 85.7% to 100.0%.

NOTE: There were no triplets during 1991-1994 and only one higher-order birth during 1991-1999.
DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

INFANT CHARACTERISTICS

Low Birthweight

Low Birthweight Births by Neighborhood Boston, 1999
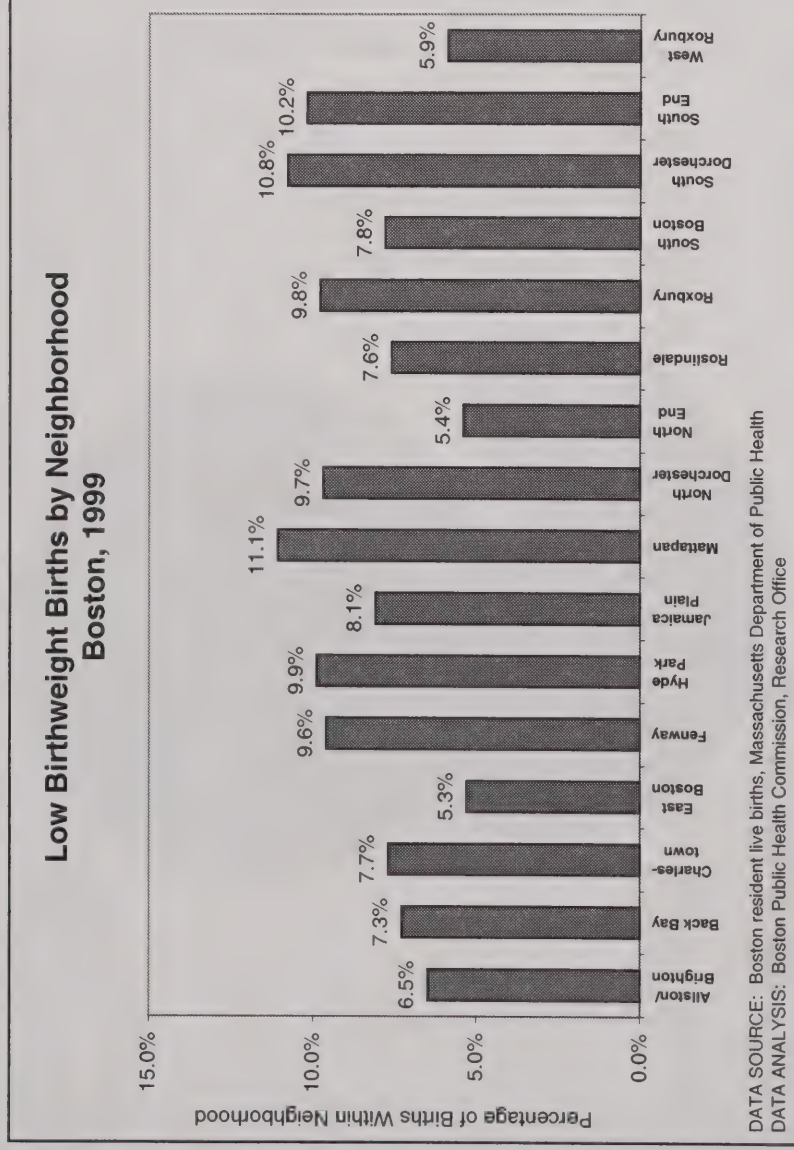
- Boston's highest rates of LBW in 1999 were among residents of Mattapan, South Dorchester, and the South End. The city's lowest rates were among residents of East Boston, the North End, and West Roxbury.

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

49

INFANT CHARACTERISTICS

Very Low Birthweight

**Very Low Birthweight Births
Boston, 1999**
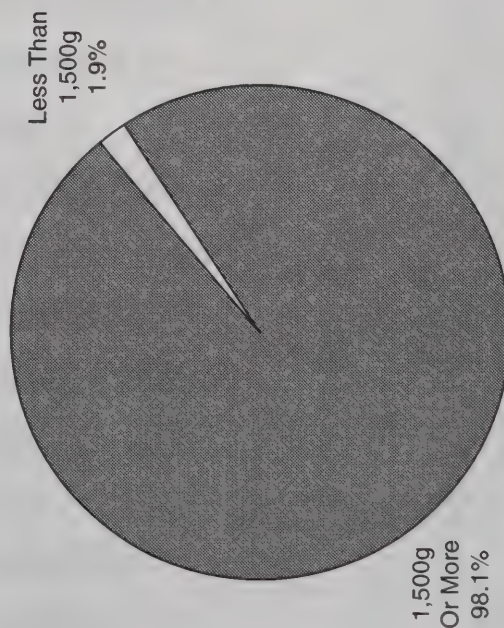
Less Than
1,500g
1.9%

1,500g
Or More
98.1%

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

- Very low birthweight (VLBW) is defined as a weight of less than 1,500 grams, or 3.3 pounds, at delivery.

- In Boston in 1999, 153 births (1.9 %) were VLBW.

- Very low birthweight among Boston births has changed little in recent years, fluctuating from a low of 1.8% (in 1991) to a high of 2.0% (in 1997).

50

INFANT CHARACTERISTICS

Preterm Birth

A preterm birth (PTB) is one that occurs at a gestational age of less than 37 completed weeks. Infants that have been born too early are at substantially increased risk of infant death, and the earlier they are born the higher their risk of dying before their first birthday. Preterm birth and low birthweight are highly correlated, with very similar race/ethnicity, age, prenatal care adequacy, and insurance status patterns.

- In Boston in 1999, 751 births (9.4%) were preterm.

- Between 1991 and 1999, preterm births reached a high of 9.8% in 1996, after which they declined. Overall, however, preterm births in Boston increased by 11.8% between 1991 and 1999.

**Preterm Births
Boston, 1999**

Less Than 37 Weeks
9.4%

37 Weeks or More
90.6%

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
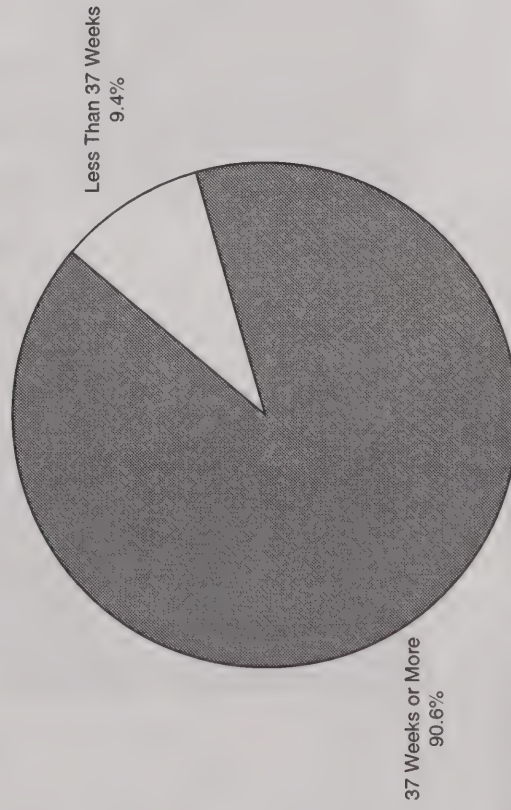DATA ANALYSIS: Boston Public Health Commission, Research Office

51

INFANT CHARACTERISTICS

Preterm Birth

Preterm Births by Neighborhood Boston, 1999

Neighborhood	Percentage
Allston/Brighton	6.7%
Back Bay	8.7%
Charlestown	7.7%
East Boston	6.8%
Fenway	8.8%
Hyde Park	9.2%
Jamaica Plain	8.7%
Mattapan	11.4%
North Dorchester	11.7%
North End	9.8%
Roslindale	9.6%
Roxbury	9.7%
South Boston	10.0%
South Dorchester	10.0%
South End	8.9%
West Roxbury	9.1%

Percentage of Births

- North Dorchester, with 172 preterm births (11.7% of its births), had the highest preterm birth rate of all Boston neighborhoods. Mattapan, South Boston, South Dorchester, the North End, Roxbury, and Roslindale also had high PTB rates. Allston/Brighton and East Boston had the lowest PTB rates of all Boston neighborhoods.

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

INFANT CHARACTERISTICS

Preterm Birth

Preterm Births by Maternal Smoking Status
Boston, 1999

- In Boston in 1999, the rate of preterm birth among women who smoked was 39.1% higher than the rate among women who did not smoke.
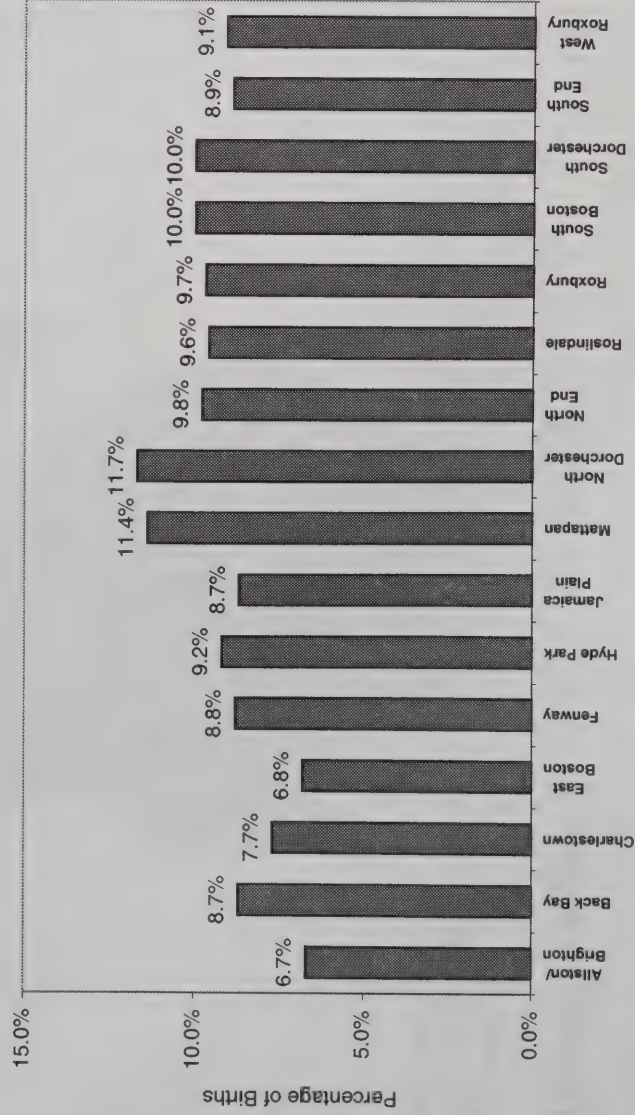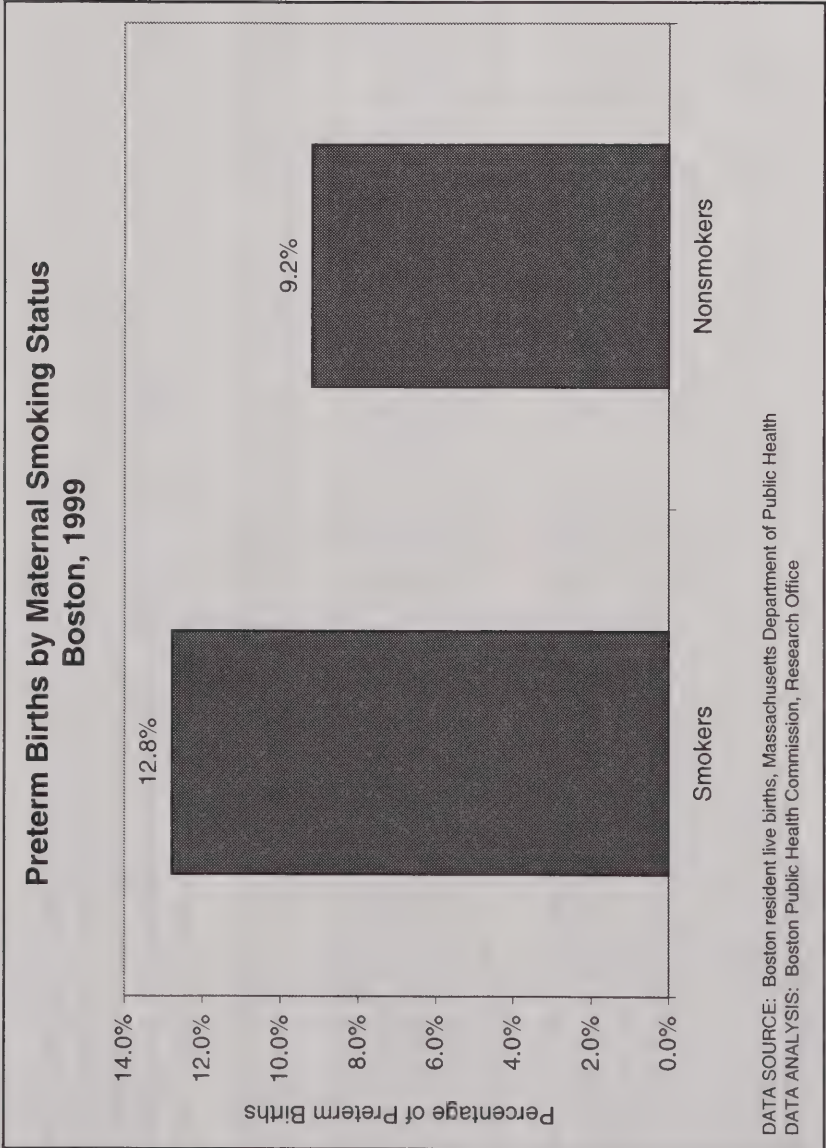
DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

53

POOR BIRTH OUTCOMES: LOGISTIC REGRESSION ANALYSIS

Introduction

The BPHC generally presents descriptive statistics (numbers, percentages, and rates) in its annual health reports. While such statistics are useful in their capacity to portray individual characteristics (for example, very low birthweight, the prevalence of smoking during pregnancy, or the adequacy of prenatal care), they are limited in their ability to look at multiple characteristics at one time. Yet this capacity is often of value in comparing one group with another or examining changes over time. It requires the ability to assess the importance of one factor as though other relevant factors were the same in each group, thus making the groups comparable to one another. To achieve this, multivariate statistical techniques such as logistic regression are used.

Logistic regression is a type of mathematical modeling that produces an estimate of the odds of having a particular outcome (for example, a very low birthweight birth) given that someone has a particular characteristic (for example, smoking during pregnancy), versus the odds of having a very low birthweight birth given that she does not smoke during pregnancy. It estimates these odds, and the ratio of one to the other, while controlling for other relevant factors, such as age, race, or education. Thus the resulting statistic, the odds ratio, compares the two groups—smokers and nonsmokers—and their likelihood of having a very low birthweight birth as though they were identical in age, race, education, and so on.

In this example, when the odds of having a very low birthweight birth are not roughly equal for smokers and nonsmokers, the magnitude of the difference between them is assessed statistically, and if it is very unlikely to have been due to chance, the finding is considered statistically significant.

Like all statistical techniques, logistic regression has inherent limitations. Although this method can help to identify a likelihood that the selected outcome and variables of interest are present together, it does not define which caused the other to occur or whether there is any causal relationship between them. Another limitation that exists when using the Boston birth data is the number and nature of the variables that can be used in a logistic regression model. If a variable of interest is rare within the group being studied, or if the group itself is small, this makes the groups more difficult to compare since a difference is less noticeable statistically. For this reason, logistic regression may fail to identify small but real differences between groups.

POOR BIRTH OUTCOMES: LOGISTIC REGRESSION ANALYSIS

Results

For this report the three outcomes that have been selected for analysis are (1) bearing a child of very low birthweight (less than 1,500 grams), (2) having a preterm birth (a birth at less than 37 completed weeks' gestation), and (3) receiving no prenatal care.

Very Low Birthweight

A strong predictor of very low birthweight among Boston women is plurality, or the number of children born from the same pregnancy. When logistic regression statistically adjusts for differences between two groups in race/ethnicity, smoking status, and maternal birthplace, women having a multiple pregnancy are about 12.5 times as likely to have a child of very low birthweight as are mothers of singletons.

Another important predictor of very low birthweight in Boston is race/ethnicity. With other characteristics, such as plurality, smoking, and maternal birthplace controlled for through logistic regression, Black women are 3.8 times as likely to have a child of very low birthweight as White women.*

Two characteristics that are less strongly related to the outcome of very low birthweight but are nonetheless significant are smoking during pregnancy and the mother's birthplace. Women who smoke during pregnancy have a higher chance of having a very low birthweight birth than non-smokers, and women who were themselves born outside the US are less likely to have a very low birthweight birth than women born in the US. Other characteristics that were tested in the model but had no predictive value were marital status, mother's education, mother's age, and mother's birthplace.

Preterm Birth

Preterm birth is defined as delivery prior to completion of 37 weeks' gestation. Applying logistic regression to the 1999 Boston birth data, certain variables of interest are predictive of preterm birth. As with very low birthweight, plurality is the strongest predictor of preterm birth. Other predictive variables shared by mothers with very low birthweight children and preterm births are race/ethnicity and smoking during pregnancy. Women who smoke during pregnancy and Black women are more likely to have a preterm birth than non-smokers and White women.

Another predictive variable for preterm birth is the adequacy of prenatal care. Women most at risk for having a preterm birth, aside from those with non-singleton pregnancies, are those who receive no prenatal care. This group is more likely to have a preterm birth than women who smoke during pregnancy or pregnant women of any specific race/ethnicity group.

Method of payment for prenatal care also predicts the probability of having a preterm birth. Women with public insurance (see glossary) are more likely than women with private insurance to have a preterm birth. The likelihood of preterm birth is even greater for public insurance holders than for women who smoke during pregnancy. Other characteristics that were tested in the model but had no predictive value were marital status, mother's education, mother's age, and mother's birthplace.

*There were insufficient numbers of VLBW births among women of other races/ethnicities to identify other racial disparities, if they exist.

POOR BIRTH OUTCOMES: LOGISTIC REGRESSION ANALYSIS

No Prenatal Care

While prenatal care is, in theory, available to all pregnant women in Boston, some women don't in fact obtain this care. Two variables that are strongly associated with not obtaining prenatal care are type of insurance and smoking status during pregnancy. Women who do not have private health insurance and women who smoke during pregnancy are significantly more likely not to obtain prenatal care than women who have private insurance and women who are non-smokers.

Black women are more likely than White women not to receive prenatal care. Other race/ethnicity groups, when compared with White women, are not significantly different in their likelihood of not receiving prenatal care. Other characteristics that were tested in the model but had no predictive value were marital status, mother's education, mother's age, and mother's birthplace.

POOR BIRTH OUTCOMES: LOGISTIC REGRESSION ANALYSIS

Adjusted Odds Ratios for Very Low Birthweight (<1,500 grams) Boston, 1999

	Very Low Birthweight (<1,500 grams)		
	Adjusted Odds Ratio	Lower 95% CI	Upper 95% CI
Race/Ethnicity			
White, Non-Hispanic[†]	1.00		
Black, Non-Hispanic	3.8	2.53	5.84
Hispanic	1.9	0.90	4.03
Asian/Pacific Islander and Other	1.4	0.77	2.68
Plurality			
Singleton[†]	1.00		
Twins or Higher	12.5	8.41	18.47
Smoking During Pregnancy			
No[†]	1.00		
Yes	1.89	1.12	3.20
Maternal Birthplace			
US[†]	1.00		
Foreign[‡]	0.65	0.44	0.96

[†]Reference group
[‡]Includes US territories
NOTE: The following variables were included in the original model, but excluded because they did not attain statistical significance: source of payment, adequacy of prenatal care, mother's marital status, mother's level of education, mother's age.
DATA SOURCE: Boston resident births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

POOR BIRTH OUTCOMES: LOGISTIC REGRESSION ANALYSIS

Adjusted Odds Ratios for Preterm Birth
Boston, 1999

	Preterm Birth (0<N<37 weeks)		
	Adjusted Odds Ratio	Lower 95% CI	Upper 95% CI
Race/Ethnicity			
White, non-Hispanic[†]	1.00		
Black, non-Hispanic	1.77	1.47	2.14
Hispanic	1.13	0.90	1.43
Asian/Pacific Islander and Other	1.11	0.79	1.57
Plurality			
Singleton[†]	1.00		
Twins or higher	18.84	14.36	24.71
Smoking During Pregnancy			
No[†]	1.00		
Yes	1.47	1.10	1.95
Prenatal Care			
Adequate Prenatal Care[†]	1.00		
Intermediate Prenatal Care	0.88	0.71	1.10
Inadequate Prenatal Care	0.86	0.57	1.31
No Prenatal Care	3.64	1.71	7.73
Method of Payment			
Private Insurance[†]	1.00		
Non-Private Insurance	1.90	1.24	2.92

[†]Reference group

NOTE: The following variables were included in the original model, but excluded because they did not attain statistical significance: mother's marital status, mother's level of education, mother's age, mother's birthplace.

DATA SOURCE: Boston resident births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

POOR BIRTH OUTCOMES: LOGISTIC REGRESSION ANALYSIS

Adjusted Odds Ratios for No Prenatal Care
Boston, 1999

	No Prenatal Care		
	Adjusted Odds Ratio	Lower 95% CI	Upper 95% CI
Race/Ethnicity			
White, non-Hispanic[†]	1.00		
Black, non-Hispanic	3.53	1.57	7.96
Hispanic	0.78	0.20	2.96
Asian/Pacific Islander and Other	2.85	0.97	8.39
Smoking During Pregnancy			
No[†]	1.00		
Yes	6.17	3.09	12.35
Method of Payment			
Private Insurance[†]	1.00		
Non-Private Insurance	5.07	1.92	13.38

†Reference group
NOTE: The following variables were included in the original model, but excluded because they did not attain
statistical significance: mother's marital status, mother's level of education, mother's age, mother's birthplace.
DATA SOURCE: Boston resident births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

POOR BIRTH OUTCOMES: LOGISTIC REGRESSION ANALYSIS

Conclusions

In summary, non-singleton pregnancies, smoking during pregnancy, Black race, and maternal birth in the US are each associated with a significantly higher likelihood of very low birthweight and preterm birth when groups are made identical through statistical mechanisms, in other respects. Smoking during pregnancy and lack of private health insurance are associated with absence of prenatal care. Both very low birthweight and preterm birth are most strongly associated with plurality. Preterm birth is strongly associated with the absence of prenatal care.

The limitations of logistic regression may obscure the larger picture of the exposure-outcome relationship. As mentioned earlier, some variables were eliminated from the model because there were too few subjects to provide statistical evidence of an association. Other variables which may be associated with the outcome were not investigated for a variety of reasons. For example, smoking is a valuable risk factor in its own right, but it is possible that smokers behave in other risky ways that cannot be measured in the vital records data. For reasons such as these, results must be interpreted as only part of a larger picture in the explanation of poor birth outcomes.

INFANT MORTALITY

Trends

Infant mortality is the death of an infant age 364 days or younger. Several causes contribute to infant mortality. Among them are congenital anomalies, respiratory distress, low birthweight (LBW), maternal pregnancy complications, sudden infant death syndrome (SIDS), lack of access to health care, and socioeconomic status (SES). The infant mortality rate (IMR) is an important measure of the well-being of infants, children, and pregnant females. Despite yearly fluctuations, IMRs are generally highest among infants born to adolescents and to women ages 35 and over. Rates differ among races/ethnicities, with Blacks (see next page) having the highest rates and Whites and Hispanics the lowest.

- In 1999, there were 59 infant deaths in Boston, an infant mortality rate (IMR) of 7.4 deaths per 1,000 live births.

- The 1999 Boston IMR was 17.5% higher than the 1998 IMR of 6.3.

- The highest IMR during the period 1991-1999 occurred in 1992 (10.3 infant deaths per 1,000 live births).

NOTE: 1999 linked birth/infant death data are not yet available from the Massachusetts Department of Public Health.

Infant Mortality Rate by Year
Boston, 1991-1999
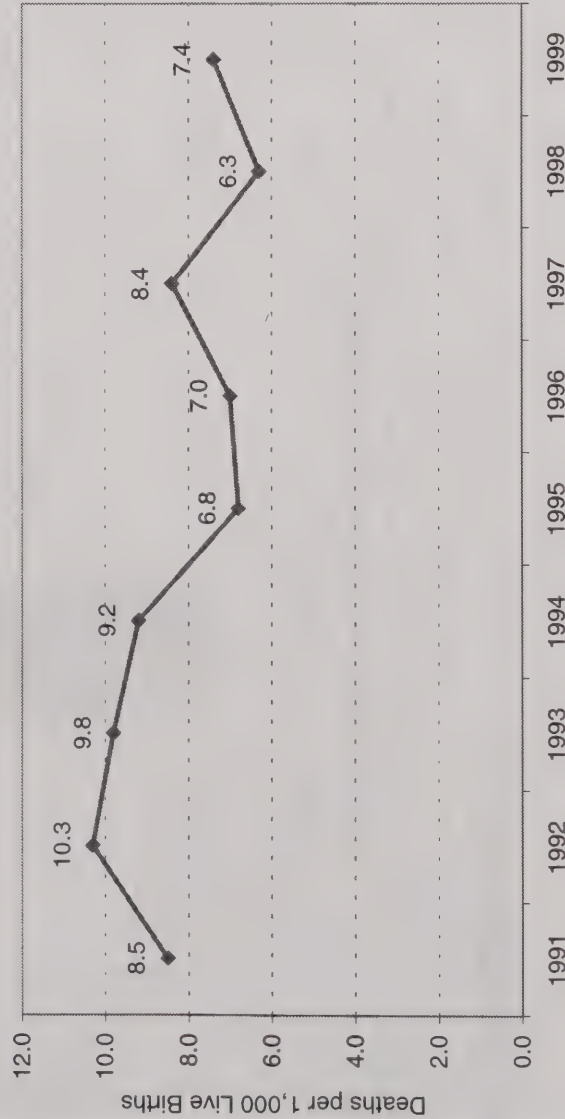
*In 1998 there were four infant deaths reported here that reported too late to be included in the files for state and federal reporting purposes.

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

INFANT MORTALITY

Race/Ethnicity

**Infant Mortality Rate by Race/Ethnicity
Boston, 1999**
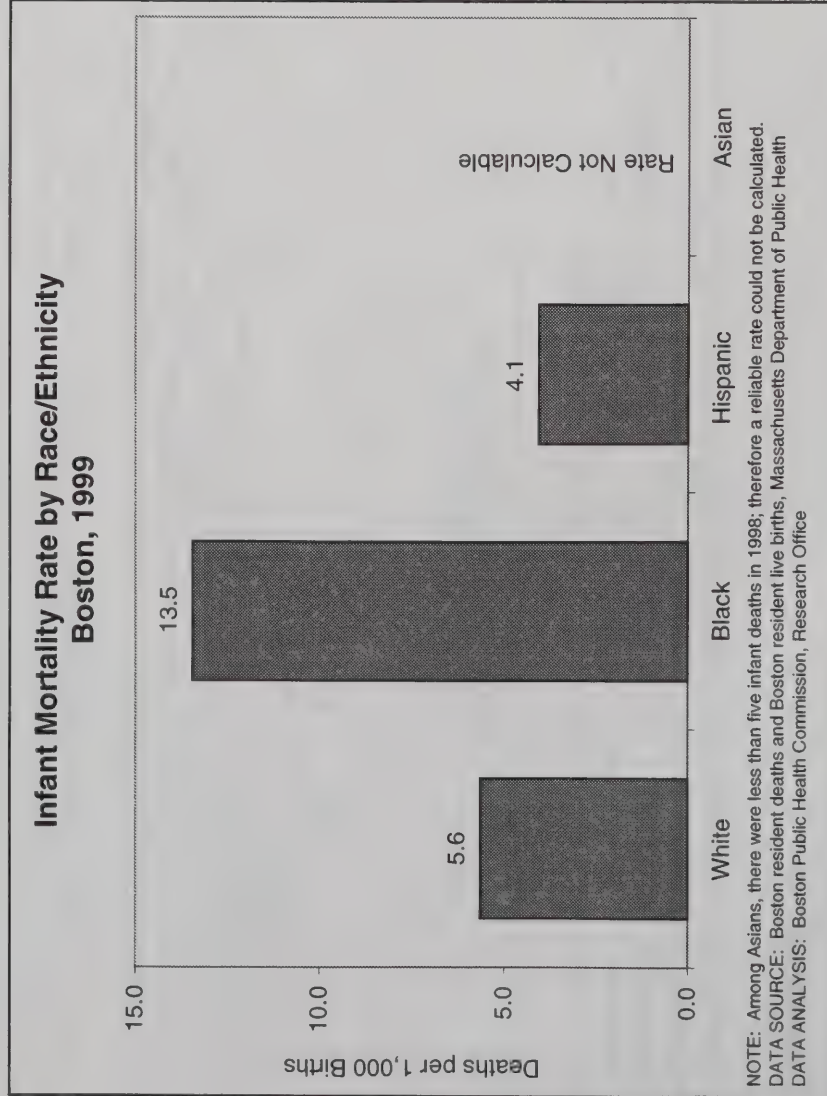
- In 1999, the IMR for Black infants was 2.4 times as high as the White rate and more than 3 times the Hispanic rate. (There were fewer than five infant deaths among Asians; therefore, a rate could not be calculated.)

- The 1999 Black IMR was 82.4% higher than the Boston rate. The IMR for White infants was 24.3% lower than the Boston rate, and the IMR for Hispanic infants was 44.6% lower.

White 5.6 | Black 13.5 | Hispanic 4.1 | Asian Rate Not Calculable

Deaths per 1,000 Births

15.0 / 10.0 / 5.0 / 0.0

NOTE: Among Asians, there were less than five infant deaths in 1998; therefore a reliable rate could not be calculated.
DATA SOURCE: Boston resident deaths and Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

INFANT MORTALITY

Race/Ethnicity Trends

Infant Mortality Rates by Race/Ethnicity and Year
Boston, 1991-1999

Deaths per 1,000 Live Births

	1991	1992	1993	1994	1995	1996	1997	1998	1999
White	7.2	5.9	5.9	7.2	4.7	6.7	9.5	4.0	5.6
Black	12.6	19.0	15.0	12.5	11.9	9.9	12.8	10.4	13.5
Hispanic	5.5	4.6	8.9	8.2	3.0	5.2	3.6	4.5	4.1
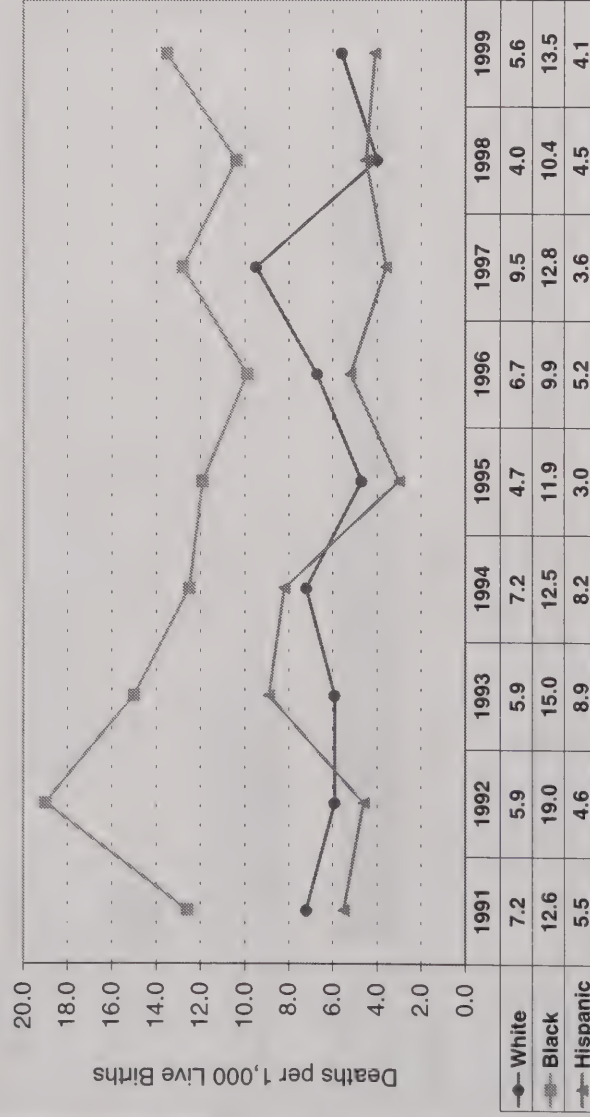
NOTE: Among Asians, there were less than five infant deaths for every year of 1991-1999; therefore a reliable rate could not be calculated.

DATA SOURCE: Boston resident deaths and Boston resident live births, Massachusetts Department of Public Health

DATA ANALYSIS: Boston Public Health Commission, Research Office

- For the entire period 1991-1999, Black infants had a higher IMR than White or Hispanic infants. Between 1991 and 1999, the Black IMR was highest in 1992 (19.0). In the years 1993 through 1996, the IMR for Blacks declined each year, increased in 1997, declined again in 1998, and increased in 1999.

- The IMR for White infants declined 22.2% between 1991 and 1999. The IMR for Hispanic infants fluctuated yearly, probably because of the low number of deaths. During each of the years 1991-1999, Asians had fewer than five infant deaths; therefore, reliable rates could not be calculated.

63

INFANT MORTALITY

Birthweight-Specific Mortality

Birthweight-Specific Infant Mortality Rate
Boston, 1998

*Less than 1,500 grams (3.3 pounds) at delivery
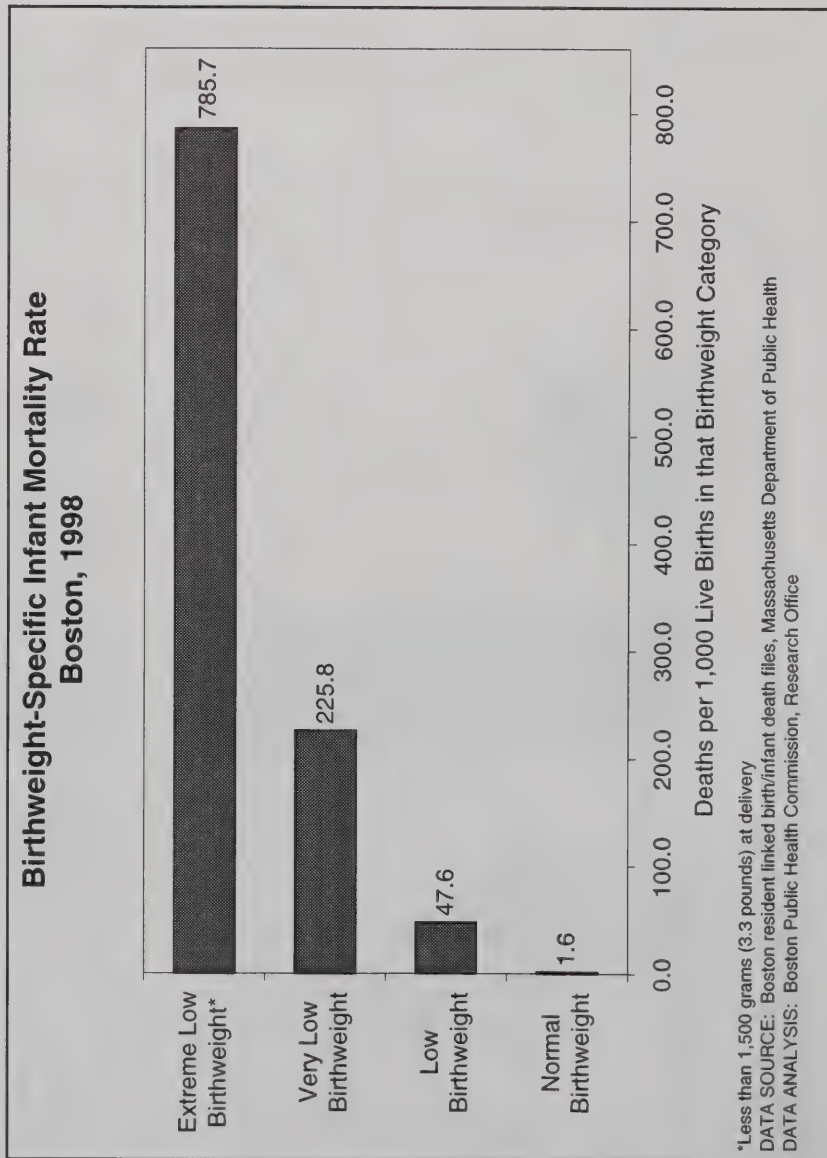DATA SOURCE: Boston resident linked birth/infant death files, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

- The IMR increases as birthweight decreases, resulting in IMRs being highest for extremely low birthweight infants.

- In 1998, the IMR for low birthweight infants was 29.8 times as high as the IMR for those of normal birthweight, the IMR for very low birthweight infants was 141.1 times as high as the IMR for NBW infants and the IMR for extremely low birthweight infants was 491.1 times as high as the IMR for normal birthweight infants.

NOTE: 1999 linked birth/infant death data are not yet available from the Massachusetts Department of Public Health.

INFANT MORTALITY

Birthweight-Specific Mortality

Birthweight-Specific Mortality Rate* by Race/Ethnicity Boston, 1995-1998

	<500 Grams	500-999 Grams	1,000-2,499 Grams	2,500+ Grams
White	833.3	326.9	21.2	1.8
Black	916.7	230.2	22.3	3.0
Hispanic	909.1	234.0	14.5	2.4

*Deaths per 1,000 live births in that age range

DATA SOURCE: Boston resident linked birth/infant death files, Massachusetts Department of Public Health

DATA ANALYSIS: Boston Public Health Commission, Research Office

- A much higher proportion of very small infants (those born weighing less than 500 grams) die than those in other birthweight categories.

- The mortality rates are similar across race/ethnicity groups. For 1995-1998, there were no statistically significant differences between the mortality rates of the racial/ethnic groups in any of the birthweight categories shown at left.

- Among Boston infants during 1995-1998, Black infants accounted for more than half (58.1%) of the extremely low birthweight births (a birthweight less than 500 grams) and about the same percentage (60.0%) of the deaths among extremely low birthweight infants.

NOTE: 1999 linked birth/infant death data are not yet available from the Massachusetts Department of Public Health.

INFANT MORTALITY

Birthweight Distribution

Cumulative Birthweight Distribution by Race/Ethnicity
Boston, 1995-1998

	<500 Grams	500-999 Grams	1,000-2,499 Grams	2,500+ Grams
White	0.1%	0.5%	5.8%	93.6%
Black	0.3%	1.3%	13.3%	87.6%
Hispanic	0.2%	0.7%	7.2%	92.0%

DATA SOURCE: Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

- As described on the previous page, mortality is highest among births in the lowest-weight categories. The fact that a much higher proportion of Black births are born at these weights largely accounts for the excess infant mortality experienced by Black infants.

- The percentage of Black births in each birthweight category <2500g was significantly higher than the percentages for the other racial/ethnic groups. The one exception was that the percentages of Black and Hispanic births at <500g were not statistically distinguishable.

NOTE: 1999 linked birth/infant death data are not yet available from the Massachusetts Department of Public Health.

INFANT MORTALITY

Maternal Age

Infant Mortality Rate by Age of Mother by Year
Boston, 1991-1998

Ages	Year							
	1991	1992	1993	1994	1995	1996	1997	1998
<19	9.2	16.0	16.7	7.9	10.0	11.2	6.0	6.0
20-24	7.5	11.9	6.7	7.3	10.2	5.9	8.8	6.6
25-29	9.5	10.8	7.9	8.9	7.1	4.3	4.8	6.7
30-34	9.7	8.4	7.8	7.7	8.1	5.4	6.3	n<5
35+	11.9	7.6	11.5	10.0	4.9	8.2	10.3	9.1

DATA SOURCE: Boston resident linked birth/infant death files, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

- Despite yearly fluctuations, IMRs generally were higher among infants born to adolescents under age 19 and to women ages 35 and over than to women of other ages.

- Between 1991 and 1998, IMRs declined for infants born to women in every age group, except ages 30-34. There were too few infant deaths in 1998 to calculate an IMR for infants of women ages 30-34, but between 1991 and 1997, their IMR declined 35.1%.

- Rates declined the most among adolescents under age 19 (34.8%), and among women ages 25-29 (29.5%). The IMR among infants of mothers ages 20-24 declined the least, 12.0%.

NOTE: 1999 linked birth/infant death data are not yet available from the Massachusetts Department of Public Health.

INFANT MORTALITY

Maternal Age

Infant Mortality Rate by Age of Mother and Race/Ethnicity
Boston, 1995-1998

Deaths per 1,000 Live Births

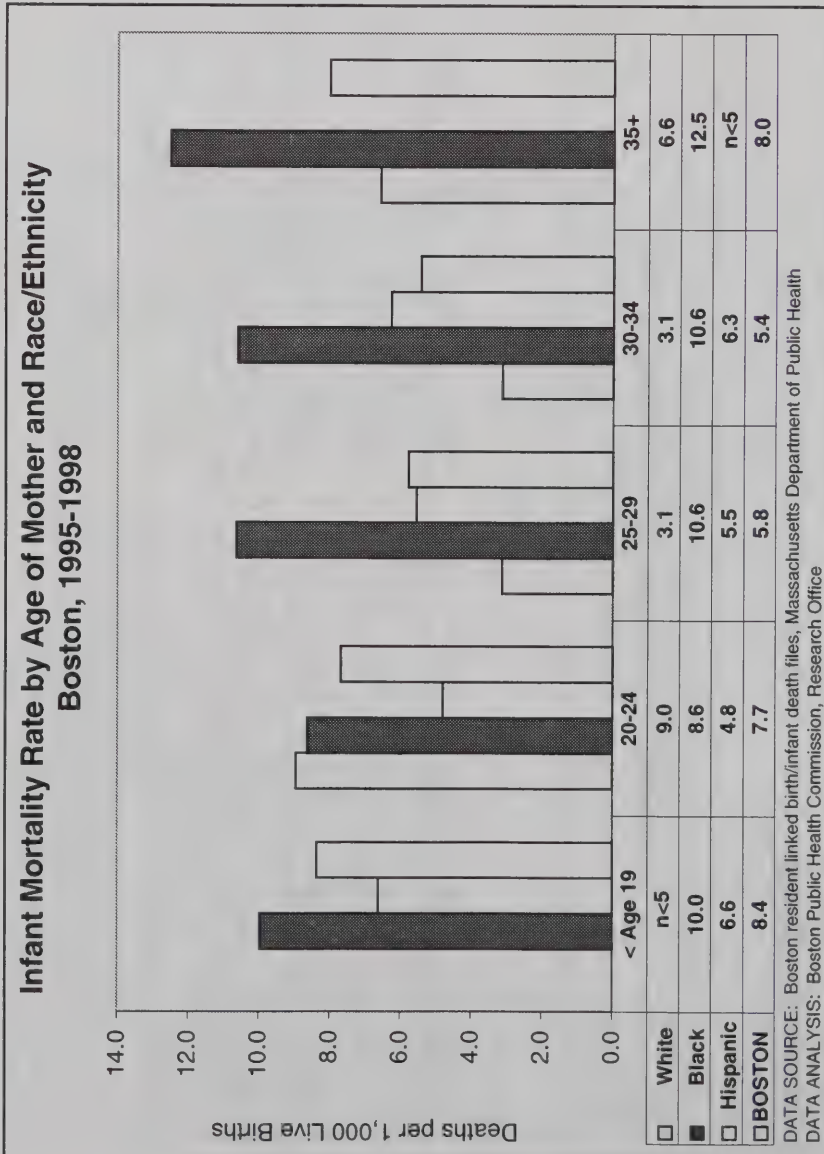|	< Age 19	20-24	25-29	30-34	35+
☐ White	n<5	9.0	3.1	3.1	6.6
■ Black	10.0	8.6	10.6	10.6	12.5
☐ Hispanic	6.6	4.8	5.5	6.3	n<5
☐ BOSTON	8.4	7.7	5.8	5.4	8.0

DATA SOURCE: Boston resident linked birth/infant death files, Massachusetts Department of Public Health
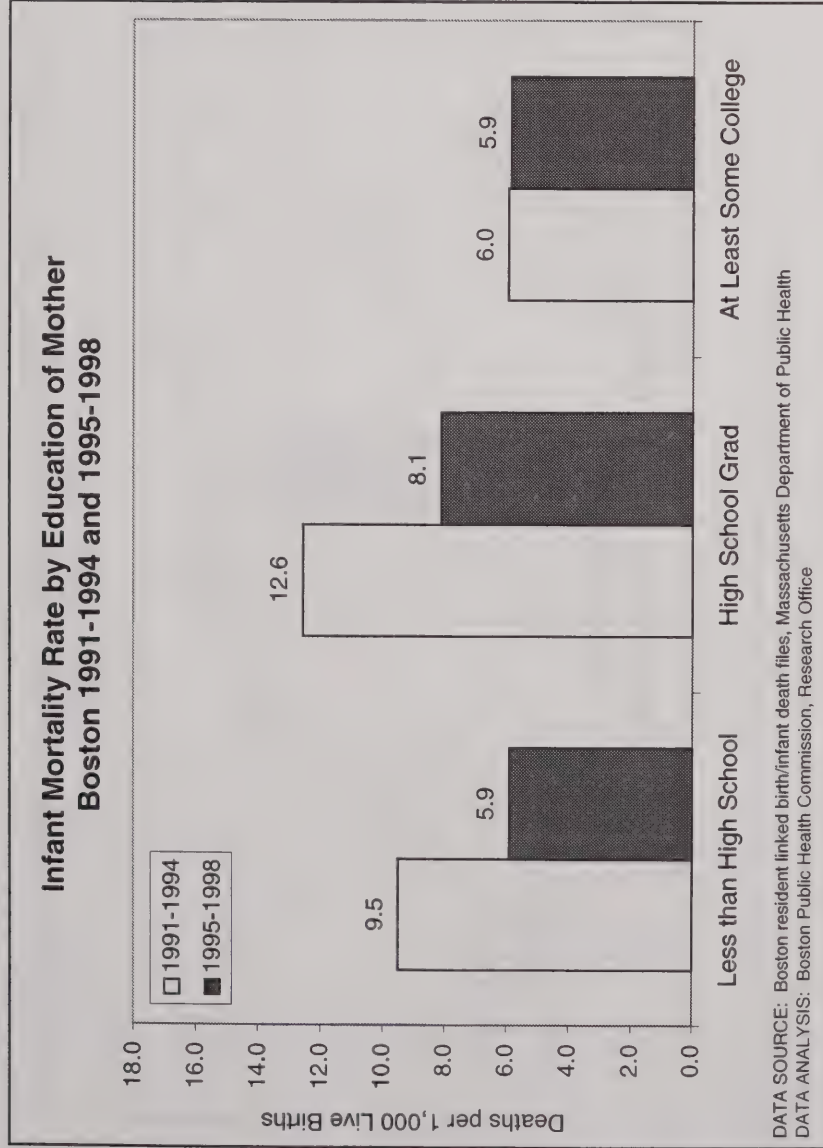DATA ANALYSIS: Boston Public Health Commission, Research Office

- During 1995-1998, the Boston IMR was statistically significantly higher for adolescents under age 19 and women ages 35 and over. This pattern held true for some races/ethnicities but not for others.

- The IMR for infants of White mothers was highest for women ages 20-24 and those ages 35 and over. For infants of Hispanic mothers, it was highest for adolescents under age 19 and those ages 30-34.

- The IMR was statistically significantly higher for infants of Black mothers under age 19 and those ages 35 and over than the IMR for infants of mothers from other races/ethnicities within those age groups.

- The IMR for infants of Black mothers ages 35 and over was statistically significantly higher than the IMR for infants of Black mothers under age 19.

NOTE: 1999 linked birth/infant death data are not yet available from the Massachusetts Department of Public Health.

INFANT MORTALITY

Maternal Educational Attainment

**Infant Mortality Rate by Education of Mother
Boston 1991-1994 and 1995-1998**

□ 1991-1994
■ 1995-1998

Deaths per 1,000 Live Births

Less than High School	High School Grad	At Least Some College

9.5 / 5.9 — 12.6 / 8.1 — 6.0 / 5.9
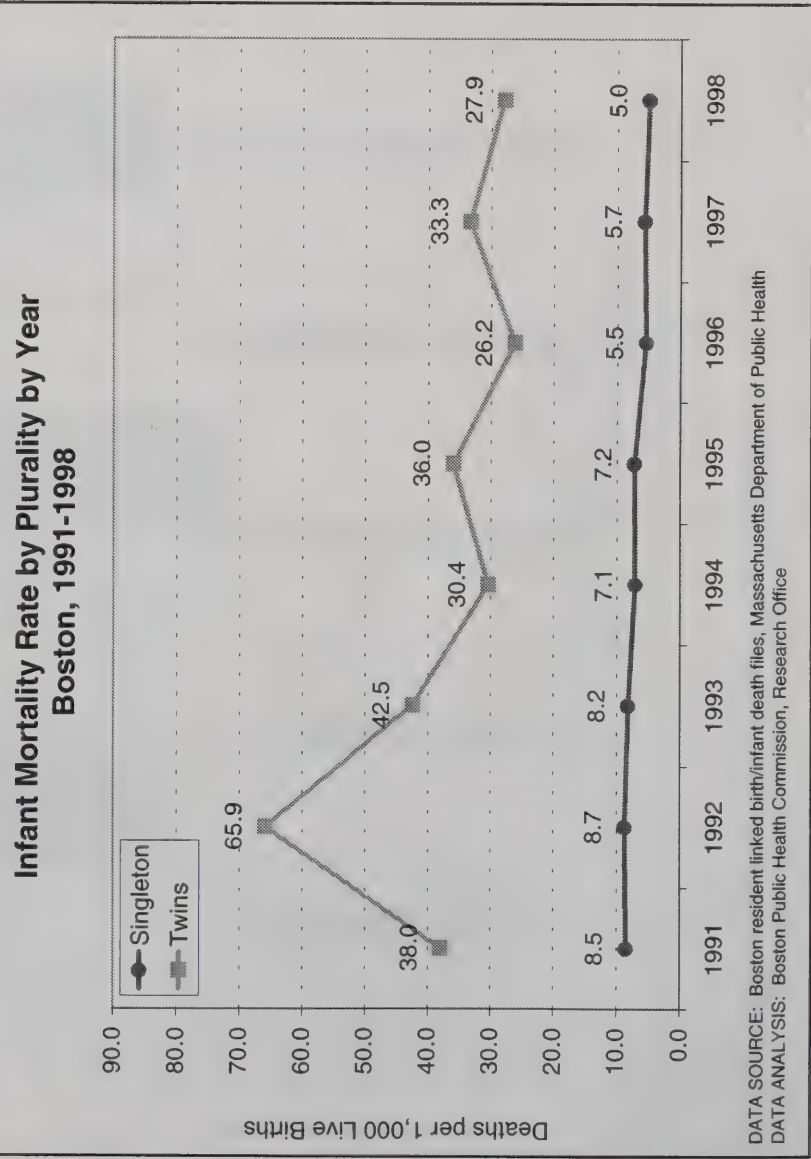
18.0 16.0 14.0 12.0 10.0 8.0 6.0 4.0 2.0 0.0

- In 1991-1994 and 1995-1998, infants born to Boston women with at least some college education had IMRs of 6.0 and 5.9 deaths per thousand live births, respectively.

- IMRs were highest for infants born to women who were high school graduates with no college education (2.6 during 1991-1994 and 8.1 during 1995-1998).

- During 1991-1994, the differences in IMRs between all educational categories were statistically significant. In 1995-1998, the differences were statistically significant between all categories except between "less than high school education" and "some college education."

NOTE: 1999 linked birth/infant death data are not yet available from the Massachusetts Department of Public Health.

DATA SOURCE: Boston resident linked birth/infant death files, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

INFANT MORTALITY

Plurality

Infant Mortality Rate by Plurality by Year
Boston, 1991-1998

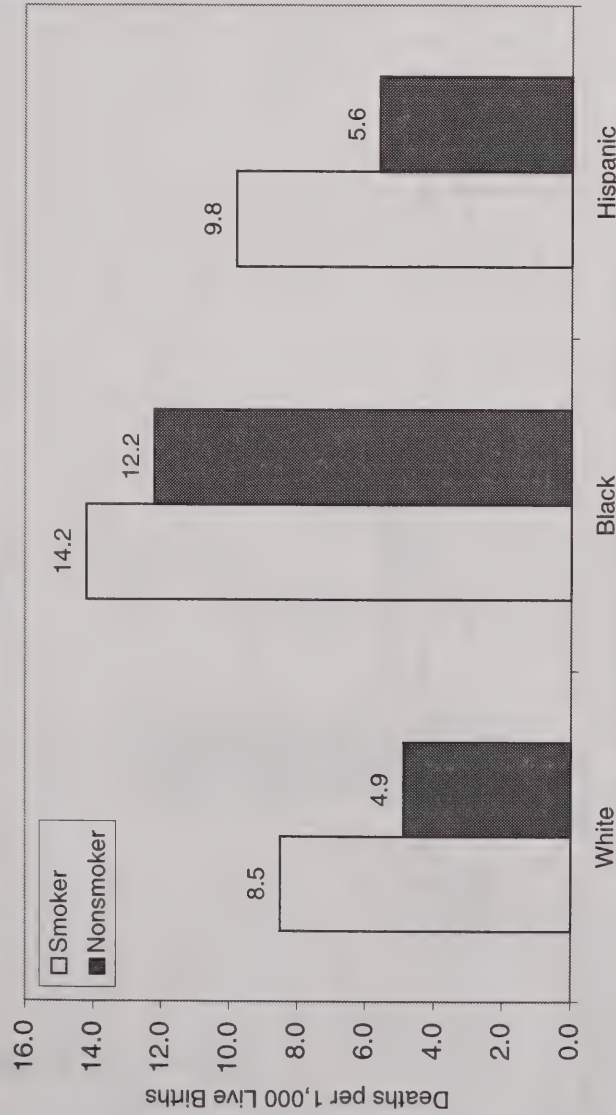Deaths per 1,000 Live Births

Singleton
Twins

- During 1991-1998, for twin births, IMRs were six to eight times as high as the IMRs for singleton births. The highest IMR for both twin births and singleton births was in 1992.

- Between 1991 and 1998, IMRs decreased for twin births as well as for singleton births. The decrease was greater for singletons (41.2%) than for twins (26.6%).

- Although there were deaths among triplets in some of the years during 1991-1998, there were too few for calculation of IMRs. There were fewer than 5 deaths among quadruplets in 1994 and no deaths in each of the remaining years.

NOTE: 1999 linked birth/infant death data are not yet available from the Massachusetts Department of Public Health.

DATA SOURCE: Boston resident linked birth/infant death files, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

INFANT MORTALITY

Smoking

Infant Mortality Rate by Smoking Status and Race/Ethnicity of the Mother Boston 1991-1998

Legend: ☐ Smoker ■ Nonsmoker

Y-axis: Deaths per 1,000 Live Births (16.0, 14.0, 12.0, 10.0, 8.0, 6.0, 4.0, 2.0, 0.0)

White: 8.5 (Smoker), 4.9 (Nonsmoker)
Black: 14.2 (Smoker), 12.2 (Nonsmoker)
Hispanic: 9.8 (Smoker), 5.6 (Nonsmoker)

NOTE: 95% confidence intervals showed no statistically significant differences in rates by smoking status.
DATA SOURCE: Boston resident linked birth/infant death files, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

- Women who smoke during pregnancy are subject to a greater risk of adverse birth outcomes, such as infant mortality, than women who do not.

- During 1991-1998, IMRs were higher for infants of all races/ethnicities when mothers reported smoking during pregnancy. The IMR was higher for Black infants whose mothers smoked than for White and Hispanic infants of smokers.

- IMRs were highest for Black infants irrespective of the smoking status of the mothers.
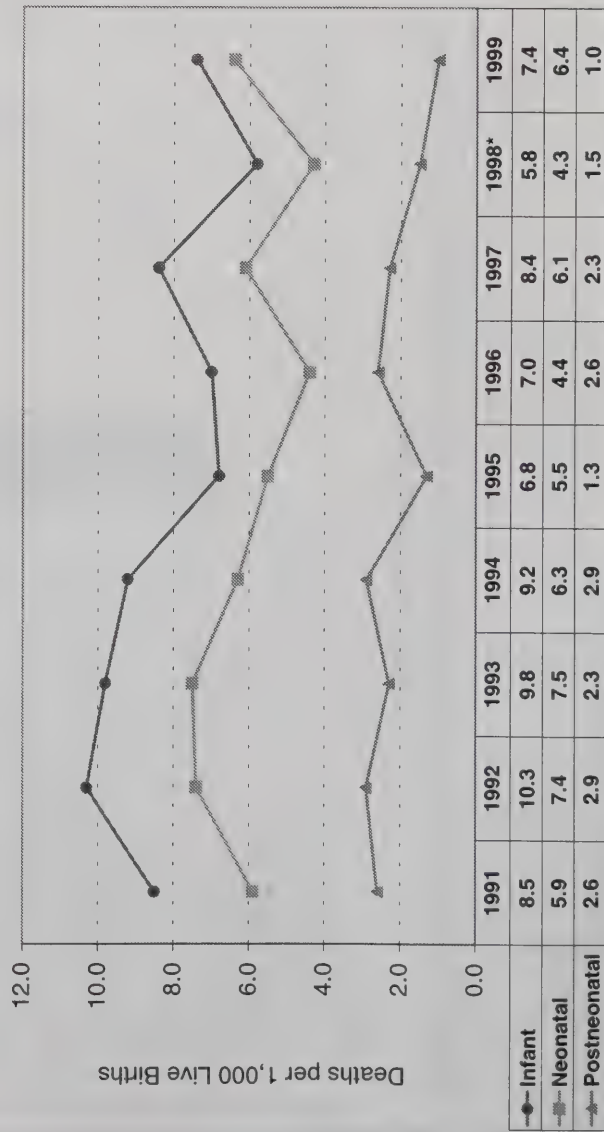
NOTE: 1999 linked birth/infant death data are not yet available from the Massachusetts Department of Public Health.

INFANT MORTALITY

Age at Death

Infant deaths during the neonatal period occur among infants under 28 days of age. Infant deaths during the postneonatal period occur at 28 through 364 days of age.

- Of the 59 infant deaths during 1999 for which age at death was known, slightly over four-fifths occurred during the neonatal period.

- Between 1998 and 1999, neonatal deaths rose 48.8%, and postneonatal deaths fell 33.3%.

- From 1991 to 1999, the neonatal mortality rate for Boston increased 8.5%, from 5.9 deaths per 1,000 live births to 6.4 deaths per 1,000 live births. Also, in the same time period, the postneonatal mortality rate declined 61.5%, from 2.6 infant deaths per 1,000 live births to 1.0 infant deaths per 1,000 live births.

Infant Mortality Rates by Age of Infant at Death by Year
Boston, 1991-1999

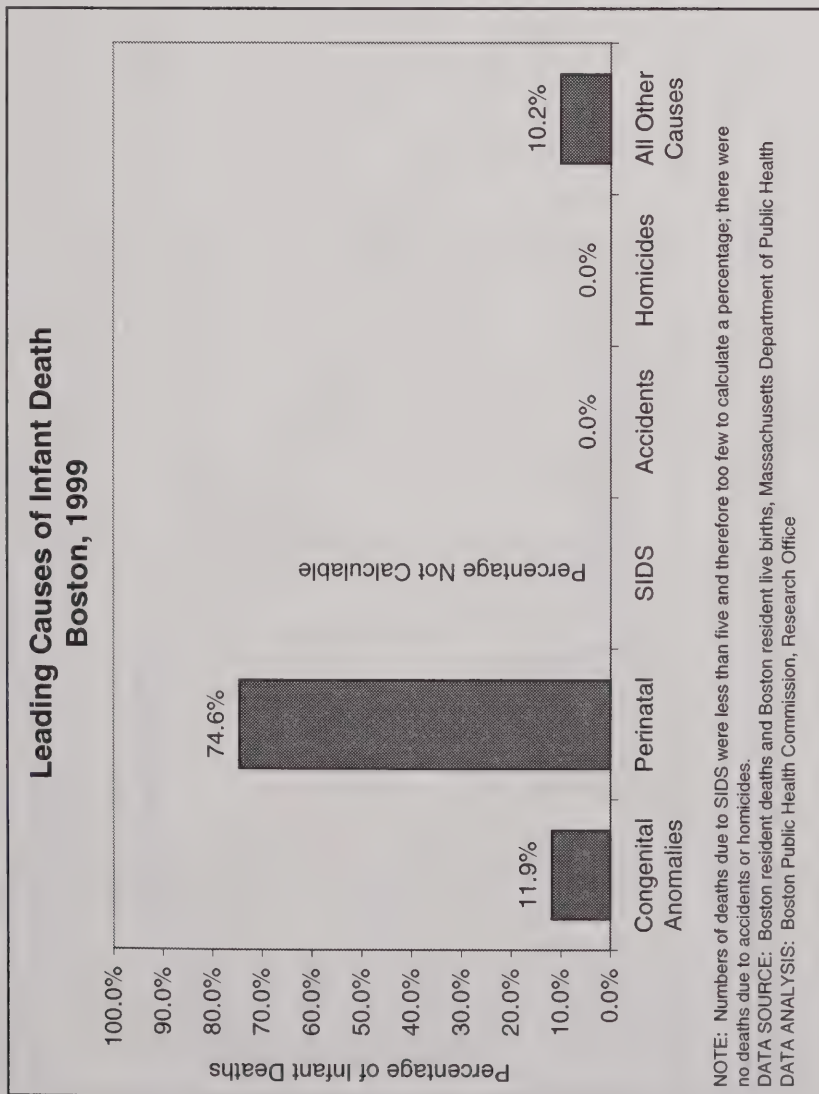|	1991	1992	1993	1994	1995	1996	1997	1998*	1999
Infant	8.5	10.3	9.8	9.2	6.8	7.0	8.4	5.8	7.4
Neonatal	5.9	7.4	7.5	6.3	5.5	4.4	6.1	4.3	6.4
Postneonatal	2.6	2.9	2.3	2.9	1.3	2.6	2.3	1.5	1.0

*NOTE: In 1998, there was a total of 50 infant deaths, for 4 of which the age was not known. The 1998 infant mortality rate calculated for this graph is based on the 46 infant deaths for which age was known.
DATA SOURCE: Boston resident deaths and live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

INFANT MORTALITY

Causes of Infant Death

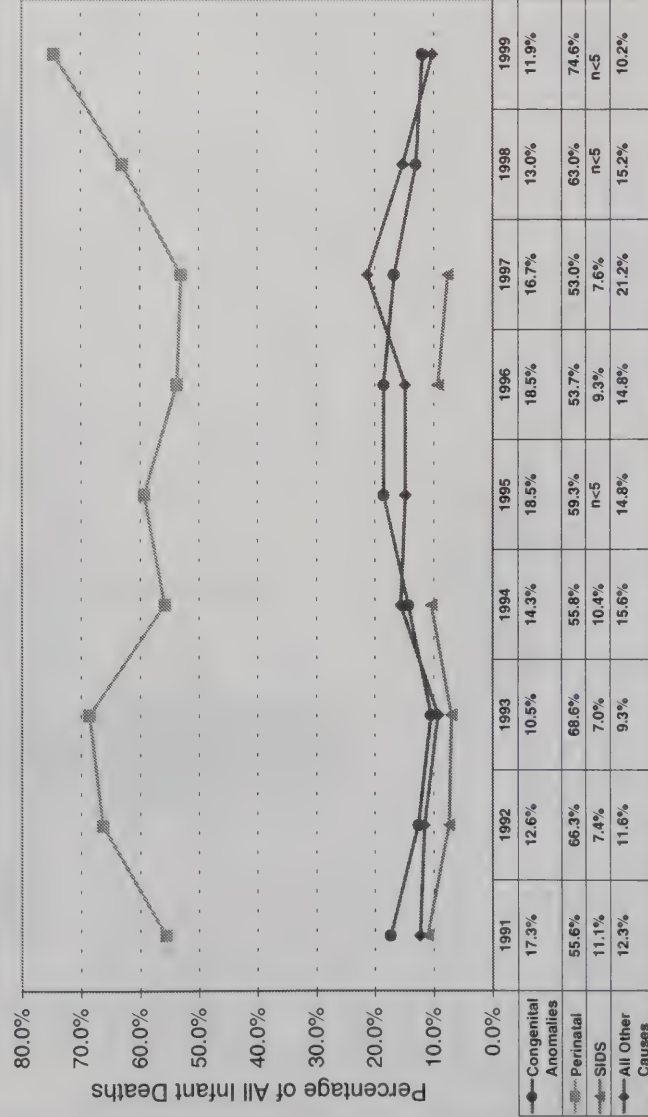**Leading Causes of Infant Death**
Boston, 1999

- The majority of Boston infant deaths each year are due to perinatal conditions, a category that includes conditions related to prematurity. These accounted for 74.6% of deaths in 1999. Other leading causes in 1999 were congenital anomalies (11.9%) and miscellaneous other causes (10.2%) such as heart, lung, and kidney diseases and deaths that are ill-defined or unknown. In 1999, there were fewer than five deaths due to SIDS and fewer than five due to injuries.

NOTE: Numbers of deaths due to SIDS were less than five and therefore too few to calculate a percentage; there were no deaths due to accidents or homicides.
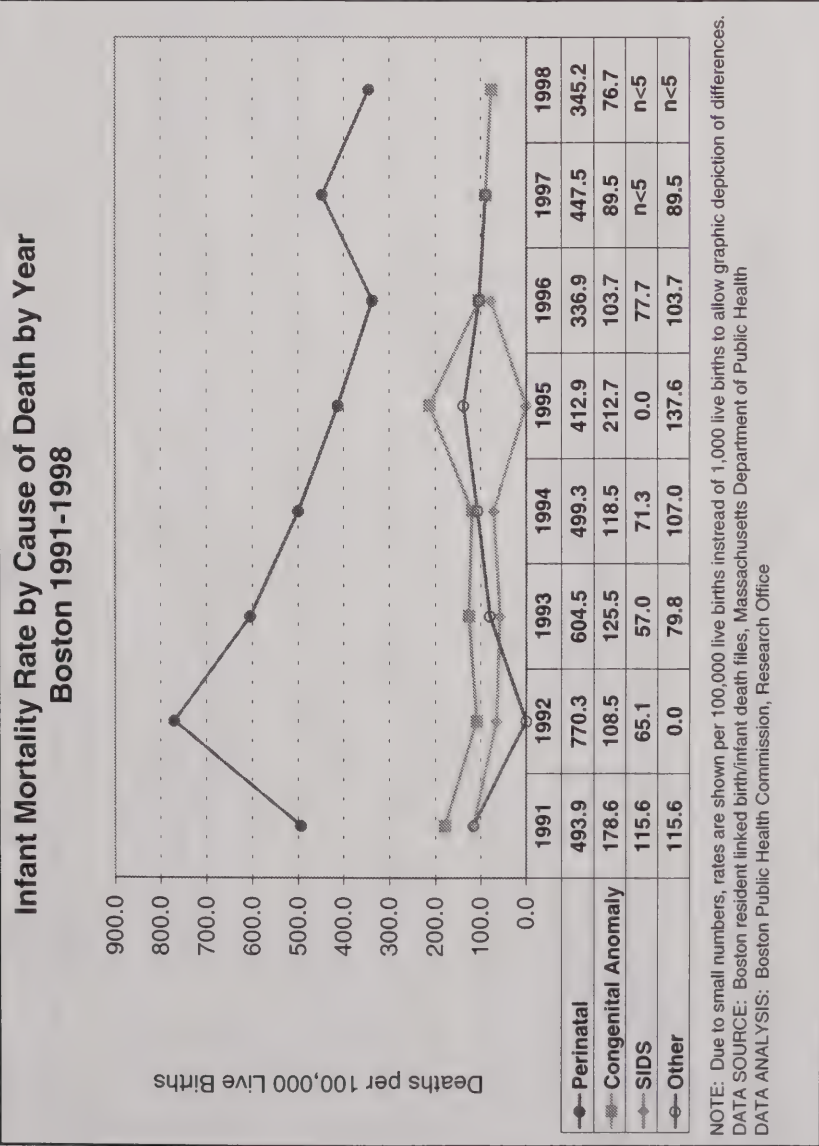DATA SOURCE: Boston resident deaths and Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

INFANT MORTALITY

Trends in Causes of Infant Death

Leading Causes of Infant Death by Year
Boston, 1991-1999

	1991	1992	1993	1994	1995	1996	1997	1998	1999
Congenital Anomalies	17.3%	12.6%	10.5%	14.3%	18.5%	18.5%	16.7%	13.0%	11.9%
Perinatal	55.6%	66.3%	68.6%	55.8%	59.3%	53.7%	53.0%	63.0%	74.6%
SIDS	11.1%	7.4%	7.0%	10.4%	n<5	9.3%	7.6%	n<5	n<5
All Other Causes	12.3%	11.6%	9.3%	15.6%	14.8%	14.8%	21.2%	15.2%	10.2%

Percentage of All Infant Deaths

- Between 1991 and 1999, deaths due to congenital anomalies declined 31.2%, and infant deaths from perinatal conditions increased 34.2%, and miscellaneous other causes declined 17.1%.

- In each of the years during 1991-1999, there were fewer than five deaths from all injuries. The number of SIDS deaths declined between 1991 and 1999. In 1991, there were 9 deaths due to SIDS, and in 1998 and 1999 there were fewer than five.

- Between 1998 and 1999, infant deaths from perinatal conditions increased 18.4%. In 1998, of all infant deaths, 63.0% were due to perinatal conditions, while in 1999 this increased to 74.6%. Infant deaths due to congenital anomalies decreased from 13.0% of infant deaths in 1998 to 11.9% of infant deaths in 1999. In 1998 and 1999, deaths from SIDS have remained below five deaths.

DATA SOURCE: Boston resident deaths and Boston resident live births, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

INFANT MORTALITY

Trends in Causes of Infant Death

Infant Mortality Rate by Cause of Death by Year
Boston 1991-1998

Deaths per 100,000 Live Births

	1991	1992	1993	1994	1995	1996	1997	1998
Perinatal	493.9	770.3	604.5	499.3	412.9	336.9	447.5	345.2
Congenital Anomaly	178.6	108.5	125.5	118.5	212.7	103.7	89.5	76.7
SIDS	115.6	65.1	57.0	71.3	0.0	77.7	n<5	n<5
Other	115.6	0.0	79.8	107.0	137.6	103.7	89.5	n<5

NOTE: Due to small numbers, rates are shown per 100,000 live births instead of 1,000 live births to allow graphic depiction of differences.
DATA SOURCE:: Boston resident linked birth/infant death files, Massachusetts Department of Public Health
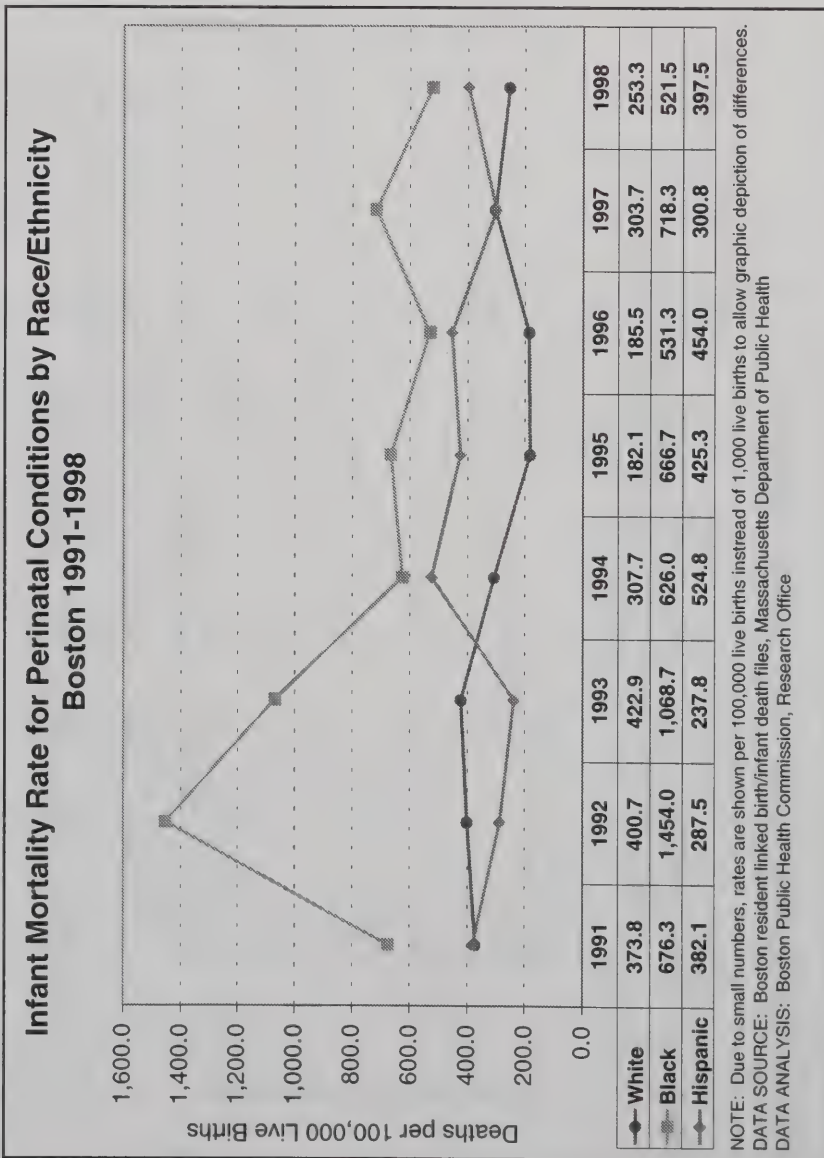DATA ANALYSIS: Boston Public Health Commission, Research Office

- Although IMRs for the leading causes of death fluctuated greatly during 1991-1998, IMRs were highest for perinatal conditions, followed by congenital anomalies.

- Between 1991 and 1998, the IMR declined 30.1% for perinatal conditions and 57.1% for congenital anomalies. There were fewer than 5 SIDS deaths during 1997 and 1998 and no SIDs deaths in 1995. However, between 1991 and 1996, the IMR due to SIDS declined 32.8%.

NOTE: 1999 linked birth/infant death data are not yet available from the Massachusetts Department of Public Health.

INFANT MORTALITY

Causes of Infant Death by Race/Ethnicity

Infant Mortality Rate for Perinatal Conditions by Race/Ethnicity Boston 1991-1998

Deaths per 100,000 Live Births

	1991	1992	1993	1994	1995	1996	1997	1998
White	373.8	400.7	422.9	307.7	182.1	185.5	303.7	253.3
Black	676.3	1,454.0	1,068.7	626.0	666.7	531.3	718.3	521.5
Hispanic	382.1	287.5	237.8	524.8	425.3	454.0	300.8	397.5

NOTE: Due to small numbers, rates are shown per 100,000 live births instread of 1,000 live births to allow graphic depiction of differences.
DATA SOURCE: Boston resident linked birth/infant death files, Massachusetts Department of Public Health
DATA ANALYSIS: Boston Public Health Commission, Research Office

- Among causes of infant deaths, perinatal conditions accounted for the highest proportion of the IMR for each year during 1991-1998.

- Black infants experienced the highest IMRs due to perinatal conditions for each year of the eight year period, and Hispanics the second highest for five of the eight years. Whites experienced the lowest IMRs for four of the eight years.

- IMRs for Black infants were as much as three to five times higher than IMRs for White and Hispanic infants.

- Between 1991 and 1998, the IMR due to perinatal conditions declined 32.2% for Whites and 22.9% for Blacks. However, it increased 4.0% for Hispanics.

NOTE: 1999 linked birth/infant death data are not yet available from the Massachusetts Department of Public Health.

TECHNICAL NOTES

Technical Notes provide explanations of many of the terms, concepts, and sources used in *Boston Natality 2001: A Report on the Health of Mothers and Infants*. Many of these subjects are also covered in the glossary. Readers can call the Boston Public Health Commission's Research Office at (617) 534-4757 for more information on any of the subjects addressed here or with other questions about the report.

Rates

Two types of rates have been included in *Boston Natality 2001: A Report on the Health of Mothers and Infants*. They are *Age-Specific Rates (ASR)* and *Infant Mortality Rates (IMR)*.

Age-Specific Rates (ASRs) take into account the size and age distribution of the population. They enable the reader to compare different groups without being concerned that differences in health status of those groups are due to differences in the size of the groups or in distribution of ages. An ASR is calculated by dividing the number of events among people in an age group by the number of people in that age group. ASRs for birth-related rates are calculated for every 1,000 women in any age group. In this report, race/ethnicity specific ASRs are also presented.

Example: The Boston ASR for births in 1999 was higher in women ages 25-34 (66.9 births to women ages 25-34 per 1,000 women ages 25-34) than among women ages 15-19 (35.3 births to women ages 15-19 per 1,000 women ages 15-19).

Infant Mortality Rates (IMRs) are used as a measure of infant deaths within a population. However, unlike mortality rates for adults or children one year of age and over, which are usually calculated for every 100,000 persons, IMRs are calculated for every 1,000 live births.

Logistic Regression

Logistic regression is a statistical technique that assesses the impact of several qualities of a population group at the same time. The goal of logistic regression analysis is to design a mathematical model that can predict a particular outcome such as low birthweight or preterm birth, known as the dependent variable. In order to do so, this model must take into account all measured factors that may affect the possibility that this outcome may occur. These factors are called independent variables and can include biological, environmental, or social elements. A successful logistic regression model will include any relevant factors and be able to predict which members of the population are likely to have the outcome of interest.

To indicate how greatly a factor predicts the outcome, a number, called the coefficient, is assigned to represent the relative strength of that relationship. A logistic regression equation integrates relationships like these into a model that includes many variables and their coefficients.

NOTE: In these analyses, race and ethnicity are investigated as contributing factors to certain outcomes. See elsewhere in the Technical Notes for discussion of the use and meaning of racial and ethnic designations in this report.

Time Periods and Small Numbers of Health-Related Events

This report contains data drawn from the period 1991 through 1999. In general, Boston-specific data are presented for the nine-year time span, either year by year or in aggregated form for the spans 1991-1999 or for 1999 only.

Determination of the time period to be used depends largely on the availability and adequacy of the data. In analyzing subgroups within the Boston population there must be a sufficient number of events, such as deaths or births, within the time period to provide reliable rates. While what is defined as a "small" number can vary, the BPHC Research Office adheres to the widespread practice of not calculating rates for fewer than five deaths, births, or other health events.

Population

Health status reports like this one use population statistics for analyzing health data. These population statistics are drawn from one of two sources, or from a combination of these two sources. The first is the census of the population taken every ten years by the federal government, literally a count of all people living in the United States, and the second is estimates of the population made by the US Census Bureau between censuses.

Each source has its own advantages, and there are distinct reasons for choosing each one. The census provides the best available actual count of the population and is usually considered the population standard. An important strength of the census is that it presents data to the level of small areas called census tracts, each of which has only a few thousand residents. These census tracts can be combined to produce neighborhood-level analyses. Recognizing this benefit, the US census codes all vital statistics (birth and death) data with census tracts.

However, while the 1990 census is the best estimate of the population for the early years included in this report, with each passing year it becomes more remote from the population it is being used to represent and therefore less useful. Changes in the population in the years following the census cannot be taken into account when using the census data.

Population projections of the population, which are often used to compensate for this problem, are made by the Census Bureau using sophisticated statistical methods. They are designed to estimate the changes which are occurring in the population between the years of the actual censuses. And yet, for the purposes of this report, estimates of population changes between census years have significant drawbacks. They do not account for changes in the racial composition of a community, and they do not permit neighborhood-level analyses. Perhaps most importantly, even small errors in the accuracy of projections for neighborhoods or other population subgroups can result in large distortions in their rates.

Therefore, this report is based largely on data from the 1990 census. Readers should note that the Massachusetts Department of Public Health uses population estimates from Massachusetts Institute for Social and Economic Research (MISER) for reports on data for the years after 1990, and the federal government frequently uses population estimates in its reports, so the rates in this report may not be comparable to those published by MDPH or the federal government.

NOTE: To provide data on people of Hispanic ethnicity, who may be of any race, this report uses the "Modified Age-Race-Sex File," produced from census data, which categorizes Hispanics separately. This avoids the double-counting which would result if Hispanics were included in the White and Black racial categories as well as in the Hispanic category.

Neighborhoods

Census tracts are so small that there are often not a sufficient number of health-related events—such as births or deaths—to calculate reliable rates, particularly for individual years. Therefore, census tracts are combined into neighborhoods for the presentation of the natality data.

Some of Boston's neighborhoods are clearly defined. West Roxbury, for example, is bordered by the West Roxbury Parkway, the Stony Brook Reservation, and Dedham. The boundaries of most neighborhoods are less distinct for historical, political, or geographic reasons.

A goal for this report was to select geographic areas that were small enough to show the variation of health patterns throughout the city while being large enough to be statistically reliable. Neighborhood definitions were discussed with residents, health care providers, and advocates throughout Boston. The definitions that are in this report are the result of that consultative process and are the same definitions used in *The Health of Boston* and other BPHC reports.

Racial and Ethnic Designations

National, state, and local health data sources usually make available data for only a few large racial and ethnic groups, and the classifications they use are not always consistent with other sources; caution should be used in comparing racial and ethnic data from different sources. The categories used in *Natality 2001: A Report on the Health of Mothers and Infants* are non-Hispanic White ("White"), non-Hispanic Black ("Black"), Asian/Pacific Islander ("Asian"), and Hispanic. These racial and ethnic designations are derived from the source of the data, including the US census, birth and death data from the Massachusetts Department of Public Health, and other sources. All data used in this report except those taken from death certificates are self-reported.

The collection of racial and ethnic data varies with the data source. Some sources may rely on observation and others on self-reporting. Race and ethnicity on a death certificates are reported by the funeral director based on information provided by a relative or friend if available, while birth certificates may combine information reported by the mother, father, or other relatives.

In considering the racial or ethnic designations used in this report for Boston-specific data, several things should be kept in mind: (1) The concept of race has different meanings in different cultures. (2) Race is not a biological but a social phenomenon. (3) The meanings of racial designations—White, Black, Asian/Pacific Islander—are subject to historical, cultural, and political forces. (4) Finally, racial designations are notably inaccurate in describing what they are called upon to describe. The term Black, for example, includes a variety of people who would describe themselves as African-American, African, Caribbean, or Haitian.

In the charts which present data by race and ethnicity or in the text which discusses health problems among racial and ethnic populations, it should be kept in mind that, as the CDC has said, "race and ethnicity are not risk factors [for disease]—they are markers used to better understand risk factors." Race is often a proxy for such factors as socioeconomic status, inadequate access to health care, and racial discrimination. Information on race and ethnicity is included in this report because it can assist public health efforts to recognize disparities between groups for a variety of health outcomes.

Boston-specific data in this report are generally presented for each racial and ethnic subgroup when data are available and numbers are large enough to allow calculation of percentages or reliable rates. Many charts may present data only for the largest racial and ethnic groups, such as non-Hispanic Whites, non-Hispanic Blacks, and Hispanics. Few sources provide data in large enough numbers for smaller groups such as the many ethnicities included in the category "Asian."

Since Hispanics can be of any race, the federal and state data sources often report data for Blacks and Whites, including Hispanics in those categories. However, the Boston-specific data in the charts and discussion provided in *Boston Natality 2001: A Report on the Health of Mothers and Infants* reports data for four separate groups—Hispanics, non-Hispanic Whites, non-Hispanic Blacks, and Asians.

Prenatal Care

Kessner Index

Prenatal care is medical care specifically associated with pregnancy, the goal of which is a healthy birth process and outcome for both the fetus and the mother. One of the most common measures of prenatal care is the Adequacy of Prenatal Care Scale (based on the Kessner Index), in which prenatal care is classified into five categories (adequate, intermediate, no prenatal care, and unknown) based upon the trimester in which prenatal care began and the number of prenatal visits. The general classification scheme is as follows:

Category	Trimester Care Began	Number of Visits
Adequate	1	9 or more
Intermediate	1	5-8
	2	5 or more
Inadequate	1	1-4
	2	1-4
	3	1 or more
No Prenatal Care	none or unknown	none or unknown

GLOSSARY

Accidents and Adverse Effects: Effects that include motor-vehicle-related injuries but that exclude homicides and suicides. ICD-9 CM codes include V01-X59, Y85-Y86. ICD-10 codes include E800.0-E949.9; ICD-10

Adolescent Births: Births to women who are between 10 and 19 years of age.

African-American: All persons identified as being born in the US who have ancestors of African descent. All racial or ethnic designations from all sources except birth and death certificates are self-reported.

Age-Specific Birth Rate: The number of births per year in a given age group per 1,000 women in that age group.

Asian: All persons identified as Asian or Pacific Islander (e.g., Chinese, Japanese, Hawaiians, Cambodians, Vietnamese, Asian Indians, Filipinos) who do not identify themselves as Hispanic. All racial or ethnic designations from all sources except birth and death certificates are self-reported.

Birth: All births reported in *Boston Natality 2001: A Report on the Health of Mothers and Infants* are live births. **See Live Births.**

Birth Rate: The number of live births per year, per 1,000 persons.

Birthweight: The weight of an infant at the time of delivery. It may be recorded in either grams or pounds/ounces. If recorded in pounds/ounces, it is converted to grams for use in this report based on the following formula: 1 pound = 453.6 grams; 1,000 grams = 2 pounds and 3 ounces.

Black: All persons identified as Black (e.g., African Americans, Haitians, West Indians) who do not identify themselves as Hispanic. (See Non-Hispanic Black.) All racial and ethnic designations from all sources except birth and death certificates are self-reported.

Cesarean Section: The extraction of the fetus by an incision through the abdomen into the uterus. Often this procedure is done as a result of pregnancy-related complication such as the fetus being too large for the pelvis. A breech presentation of the fetus is often handled by cesarean section.

Confidence Interval: The range within which lies the true value of a variable, based on a chosen probability. For example, given the probability 95%, one can be ninety-five percent certain that the true value lies between numbers X and Y. The range between X and Y is the confidence interval.

Congenital Anomaly: A structural abnormality present at birth; ICD-9-CM codes 740.0-759.9; ICD-10 codes Q00-Q99.

Crude Birth Rate: The number of live births per year, per 1,000 persons.

Demographics: The statistical study of characteristics of human populations and of population distributions such as age, sex, and race/ethnicity.

Embryo: The product of conception from implantation through the eighth week of development, after which it is referred to as a fetus.

81

Fertility Treatment: A variety of procedures and/or medications used with the purpose of conception.

Fertility: The capacity to become pregnant.

Fetus: The product of conception from the end of the eighth week of development to the moment of birth.

Forceps: An instrument used to grasp the fetal head as an aid in delivery; the delivery of an infant using such an instrument.

Gestation: The period of growth in the uterus during pregnancy.

Gestational Age: Length of pregnancy (in weeks) calculated as the number of weeks following the woman's last menstrual period.

Hispanic: Includes people of any race (Asian, Black, White, or Other) who consider themselves Hispanic or Latino, such as Puerto Rican, Mexican, Cuban, Spanish, and Dominican. All racial or ethnic designations from all sources except birth and death certificates are self-reported.

Homicide: A death intentionally caused by a person other than the deceased. ICD-9CM codes E960.0-E969.9; ICD-10 codes X85-Y09, Y87.1.

IMR: See Infant Mortality Rate.

Infant Mortality Rate (IMR): The number of deaths per 1,000 live births among infants less than one year old.

Kessner Index: See Prenatal Care in Technical Notes

LBW: See Low Birthweight.

Live Birth: Any infant who breathes or shows any other evidence of life (such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles) after separation from the mother's uterus, regardless of the duration of gestation.

Logistic Regression: A statistical analysis technique used to identify associations between independent variables, such as race or sex, and a selected dependent variable, such as cancer.

Low Birthweight (LBW): Weight of an infant at time of delivery of less than 2,500 grams (5.5 pounds).

Miscarriage: The spontaneous expulsion of embryo or fetus before the middle of the second trimester.

Morbidity: Illness, disease, or injury.

Mortality: The relative frequency of deaths in a specific time period; death rate.
Multiple Births: The birth of two or more offspring from the same pregnancy.

Neighborhood: One of 16 distinct geographical areas in Boston.

82

Neonatal Deaths: Deaths of infants under 28 days old.

Neonatal Mortality Rate: The number of neonatal deaths per 1,000 live births.

Non-Hispanic Black: All persons identified as Black (e.g., African Americans, Haitians, West Indians) and not identified as Hispanic. All racial or ethnic designations from all sources except death certificates are self-reported.

Non-Hispanic White: All persons identified as White and not Hispanic. All racial or ethnic designations from all sources except death certificates are self-reported.

Odds Ratio: A number that represents the likelihood of one group having an existing characteristic or an event occur in comparison to another group. An odds ration of 4, for example, means that a particular population (persons who smoke) is four times more likely to experience a certain condition (cancer) than some other population (persons who don't smoke).

Other Race: People identified as a race other than Black, White, or Asian (e.g., American Indian/Native American, Aleut, Eskimo) and not Hispanic. All racial or ethnic designations from all sources except death certificates are self-reported.

Parity: The number of previous live births to a woman plus the current birth.

Perinatal: Occurring during or pertaining to the periods before, during, or after the time of birth (i.e., before delivery from the 28th week of gestation through the first seven days after delivery).

Perinatal conditions: Certain conditions originating in the perinatal period. Examples of such conditions include: birth trauma, disorders related to short gestation and low birthweight, disorders related to long gestation and high birthweight, respiratory and cardiovascular disorders or infections specific to the perinatal period. ICD-10 codes P00-P96.

Plurality: The number of births to a woman from the same pregnancy; singleton is the birth of one infant, twins is the birth of two infants, triplets is the birth of three infants, etc.

Postneonatal Deaths: The number of infants dying at 28 through 364 days of age.

Postneonatal Mortality Rate: The number of postneonatal deaths per 1,000 live births.

Pregnancy: The condition of carrying a developing embryo or fetus in the uterus.

Prenatal Care (PNC): See **Prenatal Care** in Technical Notes

Preterm Birth: Birth before 37 completed weeks gestation.

Private Insurance: Health insurance not paid for by public funds. Types of private insurance include Health Maintenance Organizations (HMOs), Blue Cross/Blue Shield, and commercial insurers.

Public Insurance: Health insurance paid for by public funds. This includes Medicaid, the state Healthy Start program, other types of governmental programs, and the Uncompensated Care Fund.

Race, Other: See Other Race

SIDS: See Sudden Infant Death Syndrome.

Singleton: A pregnancy consisting of a single infant, or such an infant.

Socioeconomics: Social and economic characteristics of a population, such as education and poverty levels.

Sudden Infant Death Syndrome (SIDS): The unexpected and unexplained death of an apparently well infant, often occurring during sleep. SIDS is the most common cause of infant death between the second week and the end of the first year of life and occurs most frequently in the third and fourth months of life, in premature infants, in males, and in infants living in poverty. ICD-9-CM code 798.0; ICD-10 code R95.

Term: Birth at a gestational age of 37 or more completed weeks.

Trimester: A period of three months.
  First trimester: The first three months of pregnancy.
  Second trimester: The middle three months of pregnancy (four to six months).
  Third trimester: The final three months of pregnancy (seven to nine months).

Triplet: One of three infants from the same pregnancy.

Twin: One of two infants from the same pregnancy.

United States: For the purposes of this report, the US comprises the fifty states only; US territories are considered separately.

Vacuum Extraction: The delivery of an infant by the use of an instrument designed to apply suction to the head of the fetus.

Vaginal Birth: The delivery of an infant through the birth canal.

Very Low Birthweight (VLBW): Weight of an infant at time of delivery of less than 1,500 grams (3.3 pounds).

Weight gain: The total weight in pounds that a woman gains during her pregnancy. The current general guidelines recommend that a woman of normal weight and average height gain no less than 15 pounds and no more than 40 pounds.

White: All persons identified as White who do not identify themselves as Hispanic. (See non-Hispanic White.) All racial or ethnic designations from all sources except death certificates are self-reported.